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ABSTRACT

The second of two meetings dealing with deprivation and disadvantage in education concentrated attention on the problems in developing countries. In many countries the problems are so complex that rational analysis is not undertaken; decisions are made on the basis of political expediency or on economically based criteria. In most cases, whole populations suffer deprivation and disadvantage, making it imperative to undertake programs which will have widespread impact. This meeting confined its discussions to the physical condition of children and studied the effects of malnutrition and endemic diseases on education and, at the same time, considered possible ways of solving the problems. The report contains a summary of the discussions covering the role of education against malnutrition and diseases and exploring possible means of promoting government and international action in arriving at solutions. A second part includes some of the papers presented at the meeting. A bibliography is divided into four broad categories: 1) Nutrition; 2) Diseases; 3) Educational and Social Factors; and 4) Demographic, Economic, and Other Factors. It is the hope of the Institute that the report will clarify to developed nations the problems faced and will indicate likely lines for research and action. (JMB)

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Unesco Institute for Education, Hamburg

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Report on a Meeting of Experts
from 2 to 6 November 1970

edited by
K. F. SMART

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Unesco Institute for Education, Hamburg

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PREFACE

This book is a report on the meeting which was held at the Unesco Institute for Education in Hamburg from 2 to 6 November 1970 on a special aspect of Deprivation and Disadvantage in Education. It was the second meeting of its kind. The first one was organised in 1967 and the report on it, entitled "Deprivation and Disadvantage: Nature and Manifestations" (edited by A. Harry Passow), was published in 1970.

While the first meeting dealt mainly with problems in the so-called developed world, this meeting concentrated its attention on those of the developing countries. Because of the enormous scope of the problems of educational disadvantage, the meeting confined its discussions to the physical condition of children and studied the effects of malnutrition and endemic diseases on education and at the same time considered possible ways of solving the problem.

The report contains a summary of the discussions as well as selected extracts from contributions to the meeting. It is the hope of the Unesco Institute that it will throw some light on the problem which is facing many countries today, and will prove beneficial in trying to alleviate the situation.

The Unesco Institute is greatly indebted to the Editor Mr. K.F. Smart, and to those who contributed to the report, as well as to all who participated in the meeting which made this publication possible.

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PART I

REPORT ON THE CONFERENCE

1. INTRODUCTION

If one attempts to study the problem of deprivation and disadvantage on a world scale, it soon becomes apparent that it is hardly possible to study the advanced industrialised countries and the developing countries at the same time. The character of deprivation and disadvantage varies between the two types of country, both in form and in intensity. When one looks more closely at cultural and educational disadvantage, one recognises at once the immediate causes as lack of premises, lack of teachers, lack of libraries and equipment, but one also realises that in the advanced countries these deficiencies may exist only as social or geographical disparities, whereas in the developing countries the deficiencies may be generalised over the whole country and experienced in common by most of the population.

In the advanced countries, the point of economic 'take-off' has been passed and a self-sustaining growth has been embarked upon, so that even though disparities may exist between one social class and another, or between one region and another, nevertheless the causes of the disparities can be identified without undue difficulty, and if the will is there, ways can be found to even them out. Such countries not only have material resources which they are exploiting, but they also have human resources which are developed to the point of being able to support continued evolution of educational and social institutions, as well as providing skilled manpower for economic development. Consumer demand by a relatively enlightened general population provides motivation for continued growth, whilst a complex economic structure and an already fully developed system of public education between them provide sufficient flexibility for a wide range of policy options. For example, it would be possible for a British government to subsidise housing to a greater extent than at present, if it were prepared to reduce its expenditure in some other directions; the choice of options is a genuine choice. Although some people in Great Britain would benefit greatly from an increased provision of subsidised housing, it cannot be claimed that the majority of the population is in desperate need of such a decision. Or if we think of health services in the U.S.A., we cannot claim that the country could not afford a national subsidised health service, or that the educational system could not train the staff for such a service if called upon to do so: the reliance upon private provision of medical care is based on a political philosophy, not on an economic necessity.

In the developing countries, on the other hand, one is faced with a situation in which the range of genuine choice is much narrower or even virtually non-existent. In some countries it is acutely difficult to establish criteria for action other than purely economic ones, and philosophical or cultural criteria become regarded as an expensive luxury. In others the problems are so complex that rational analysis is not undertaken, and decisions are taken on the basis perhaps of political expediency, perhaps out of a simplistic or sceptical notion that where so much needs to be done, anything at all will be useful and the question of priorities does not arise.

The second point to be made about developing countries is that in most cases it is not primarily the members of one social class or the inhabitants of one particular geographical area who suffer deprivation and disadvantage, but virtually the whole population. This is not to say that disparities do not exist, but only that the importance of the disparities is outweighed by the massive scale of the national problem. Further, we may say that the widespread occurrence of deprivation and disadvantage imposes an obligation to undertake (as far as possible) remedial action

which will have a widespread impact, and to be wary of measures which have a socially or geographically limited impact, unless they have wider applicability or propaganda significance.

Students of 'Third World' affairs have often tended to beg the question of priorities, by adopting a very specific point of view or by postulating a simply-conceived solution to one clearly-defined part of the problem, e.g. "What these countries need is industrialisation"; "Education is the key"; "My own field is agriculture, and I leave the broader issues to planners on a higher level". In recent years, however, it has become more generally realised that not only do actions in one field have an impact in other fields, but that certain forms of action may be specifically designed to produce measurable benefits in more than one field. As far as education is concerned, some interesting examples may be quoted. The 'manpower approach' to educational planning not only leads to a desirable caution regarding the costs of education in general, but also to a healthy scepticism with reference to traditional forms of structure and curriculum of formal education. The idea of 'functional literacy' seeks to provide both a rationale and a methodology for adult literacy to replace the rather vague optimism which characterised many previous actions in this field. The now widespread and growing interest in educational planning and in the application of management techniques in educational administration is symptomatic of a growing awareness on the part of educators that education is no longer an autonomous and self-justifying enterprise.

It was essentially this line of thought that led the Unesco Institute for Education to bring together a group of people from different disciplines, in the hope that study of the forms of deprivation and disadvantage manifest on one plane of human existence might throw light upon the area of contiguity between this plane and the educational or cultural plane. The three main planes considered were the physical, the social and the economic. The social and economic forms of deprivation are extremely complex in themselves, and also relate in a very intricate way with cultural and educational factors. It was therefore decided to concentrate on malnutrition and endemic diseases as fairly readily identificable and measurable factors within the area 'physical deprivation' and, moreover, as a field of study to which perhaps insufficient attention has hitherto been paid, at least by educators. In particular, it was hoped to throw light upon correlations between medical and nutritional factors on the one hand and educational ones on the other, with a view to indicating likely lines for research leading to early useful applications and also directions in which joint actions by medical services and educational services might be worthwhile.

2. ANALYSIS OF THE PRESENT SITUATION

2.1 Forms of Educational Wastage and Disadvantage

Before embarking on any discussion of relationships between health and education it would be desirable to verify the presumption that these are in fact areas of concern for the developing countries. For education, the survey of seventy-five countries carried out by Harbison and Myers (1964, III.[+]) led to the general conclusion that the countries which we describe as 'developing' are characterised not only by economic

[+] The roman numerals refer to the four sections of the bibliography.

poverty (a per capita GNP of less than $ 500), but also by a relatively low level of human resource development as reflected in various indices of development of their formal educational systems. For nutrition, the figures for consumption of animal protein are available from FAO reports, whilst for a general medical indicator the figures for expectation of life are available. If one places these three classifications side by side, one finds a close correlation. In the whole of Central and South America, Africa and Asia, only a handful of countries have a per capita GNP of more than $ 400 and a substantial majority has less than $ 200. With few exceptions, all these regions have a poor or very poor nutritional standard as reflected by the protein consumption indicator, and a low or very low expectation of life.

There is no shortage of data to show the educational deprivation from which many of the people of these countries suffer. However, it is not useful in the present context to establish correlations between medical or nutritional data and statistics on the availability of school places at various educational levels, since availability is more often than not a reflection of other factors, mostly economic. One ought rather to establish the facts regarding the extent to which school places are taken up and effectively used and the general efficiency with which educational institutions (both formal and informal) fulfil their functions. The principal phenomena with which one is concerned are described as 'drop-out' and 'repeating' and the combined effect may be described as wastage, since both are aspects either of pupils' failure to complete a course which is designed to be pursued to the end or of pupils' taking an above-normal length of time.

The possible causes of wastage will be considered in a later section of this report; the present section considers only its extent. In P.H. Coombs' wide-ranging survey "The World Crisis in Education" (1968, III.) one finds reference, backed by data from numerous countries, to the high rate of drop-out from primary schools. For example, out of every 100 pupils registered in Class One in Madagascar, only 23 could be expected to remain at school up to the sixth year of primary education; the figure for Senegal was 84, with figures for eleven other countries lying between these two extremes. The rate of drop-out seems to be significant at all levels of primary education, but particularly high rates of drop-out appear to occur in the earlier classes (one or two countries even record drop-out rates as high as 20% for Class One).

The term 'wastage' is a very appropriate one to apply to the phenomenon of drop-out, since the child who drops out of school after only three years or less is almost certainly either still illiterate or only semi-literate, and his curtailed attendance at school does in effect represent a waste of his teachers' efforts as well as of other resources. Of course dropping-out does take place in advanced countries too, but there the term is normally taken to refer to pupils who fail to complete secondary education. In most cases some kind of statutory obligation exists to ensure that the great majority of children obtain a complete primary education and at least a partial secondary education. In the developing countries statutory compulsion is not feasible, for economic reasons, and the very fact that places are limited in number makes it essential that such places as are available be used in the optimum way. It is a tragic irony at present that, while governments are spending as much as they can afford in order to extend the possibility of schooling to a larger proportion of their young people, few appear to be able to control the waste of resources that dropping-out represents (e.g. the Philippines government in its report to the Unesco Technical Seminar on Educational Wastage and School Drop-outs, held in Bangkok from 5th to 12th September 1966, set a value of 35 million pesos - about 5 million dollars -

on the waste represented by drop-out in 1963/64). Perhaps even more serious, and incalculable, is the human tragedy of all the many million persons throughout the Third World who receive a little schooling but not enough to be of any real use to themselves or to their communities.

The other side of wastage in school systems is repeating. This is more patent a form of educational failure than is dropping-out, but since a child who repeats a class is at least still in the system, and since repeating is a common and accepted phenomena in the educational systems of most advanced countries, it is often regarded as being less serious a problem than drop-out. In some countries figures for repeating are not available or are not reliable, owing to the generally undeveloped state of official statistics; in others the fiction is maintained that repeating does not exist, because it is contrary to official policy that it should exist; whilst in others it really does not exist, its non-existence being assured by universal low standards for promotion. In the Philippines, a national survey (see the report mentioned in the last paragraph) elicited an average repeater rate of 6.74% in 1963/64, with an estimated economic cost of 29 million pesos; whilst an African enquiry quoted by Coombs (1968, IV.) gives the information that in Gabon, Ivory Coast and Mali over two-thirds of primary children take at least a year and about one-third take at least two years longer than the prescribed time to complete their primary school course. Again, one can make calculations of the economic cost of inefficiency of the educational machine, but one cannot calculate the significance of human failure or discouragement on such a massive scale, nor can one begin to take reforming steps unless one discovers something of the causes. The next section discusses one part of this problem.

2.2 Effects of Malnutrition and Diseases on the Educational Development of Children

In the Introduction, we referred to basic differences between developed and developing countries, and especially to the fact that in the developing countries one finds the majority of the population is exposed to deprivations and disadvantages, which in the advanced countries only some of the people suffer. Perhaps one should start this section with a more specific description of the forms of malnutrition and diseases to be encountered in the developing countries.

A good diet is one in which there are sufficient proteins, fats, carbohydrates, vitamins, minerals and water.

A person is said to be undernourished if he does not obtain a sufficient amount of any form of food at all, so that the energy requirements of the body for performing its basic functions are not met. Although this situation is fairly common, it is not universal throughout the Third World. Where it does exist, it may be due to general poverty and be widespread in a region, or it is due to a specific disaster, whether national or localised, e.g. crop failure, flooding, drought, pests, etc. On the other hand, it is possible that people may have adequate food (as far as overall quantity is concerned), but may live on a diet from which one ingredient is lacking. This is called malnutrition, as distinct from under-nutrition; it is widespread in the developing countries, and very diverse both in its causes and in its consequences. The former may include poverty, ignorance, tradition, religious belief or fortuitous environmental factors; the latter may range from physical inconvenience or a hardly noticeable (especially if universal) diminution of competence to serious illness or death. Although malnutrition may consist in the lack of one essential component of the good diet, in practice it is more often encountered as multiple or mutually-reinforcing deficiencies.

One of the most serious, widespread and well-documented nutritional deficiencies is that of animal protein. Professor F. Aylward (1963, I.) quotes 30 grams per person per day as the normal human requirement (the actual need will vary according to the weight, sex and occupation of the individual). Three-quarters of the developing countries consume less than half this amount, on average, and only a handful of them consume more. The gross clinical form of protein malnutrition is kwashiorkor which can be fatal, but even milder protein deficiency can have serious consquences, some of which are irreversible if suffered in early childhood.

All the vitamins are necessary, and certain ones may be lacking from some of the usual diets in certain countries or regions. Among the symptoms of vitamin deficiency it may be worth-while to note the effect on eyesight of Vitamin A deficiency and the cerebral damage associated with acute forms of Vitamin B deficiency diseases. Certain minerals are also necessary for a good diet, especially calcium, phosphorus, iron and iodine: of these, iron is an essential constituent of haemoglobin, whilst iodine is necessary for the functioning of the thyroid gland which controls general metabolism. It is clear then that deficiency diseases in general and protein malnutrition in particular form a significant group of endemic diseases which may lead to general physical debility with associated lassitude, as well as to more specific symptoms, either physical, intellectual or psychological. As far as school-children are concerned, the results of any form of malnutrition may include absence from school, apathy while in school, or reduced potential.

Apart from malnutrition diseases, three other important groups of diseases are endemic in many or most of the developing countries. The first is made up of those diseases which are endemic in tropical areas but which sometimes spread out, occasionally even into temperate zones, and assume epidemic proportions, namely smallpox, yellow fever, cholera, plague and typhus. The second group includes diseases which are not notifiable but which can be very dangerous, such as poliomyelitis and meningitis, as well as others which may lie undiagnosed or which may present only relatively mild symptoms, such as malaria, tuberculosis and gastroenteritis. Some diseases in this group afflict very large numbers of people who do nothing or take inadequate steps for prophylaxis or treatment. Their seriousness may perhaps be reflected in the data on child deaths presented at pp. 128 ff. "Les Conditions de vie de l'enfant en milieu rural en Afrique" (1968, I.) The causes of death in a sample of 345 hospitalised children were:

diarrhoea	33%
malaria	21%
measles	16%
other infections	10%
malnutrition	8%
pneumonia	5%
unknown	7%.

Subjective observation leads one to infer that a large number of people, especially young children, do not die from these ailments, but endure them over long periods. Although malaria has been eradicated from some countries and its impact has been generally reduced, it still is endemic in many places, as are various forms of dysentery. The treatment of these ailments, especially in rural areas, is often perfunctory or negligible, and even in a mild form they produce a general debilitating effect. Finally, the third group comprises leprosy and various parasite infections which cause many kinds of physical handicaps, as well as, again, much general debility. Many

of these diseases are, in fact, preventable, but in many cases resistance to them is reduced by the general debility caused by malnutrition, malaria, etc.

As soon as one starts to look at the effect of all these forms of malnutrition and disease upon the development of the child during the various stages of his growth, one comes face to face with what is the central problem of this whole subject. A good deal of information exists or can be obtained about children's educational progress in school; but as regards children not at school and as regards the interaction of physical, intellectual and psychological factors, one has to rely to an undesirable extent on subjective observation or circumstantial evidence. Nevertheless, an attempt will be made in the following paragraphs to indicate at least tentative conclusions.

Perhaps it would be logical to start with a reference to the situation of the mother and the child at the time when their lives are intimately linked, that is, from the moment of conception through the period of pregnancy and the earliest months of babyhood up to the period of weaning. At this stage, it is likely that the child will inherit physical deficiency, and perhaps also a reduced intellectual potential, as a result of malnutrition or disease during the period of pregnancy. Dr. Canosa's paper, reproduced in Part II of this book, bears on this point. There appears to be some evidence of 'intra-uterine malnutrition' affecting the child especially during the last three months of the pregnancy, when the child's weight should normally triple. During the pregnancy and the earliest period of the child's life, the essential components of the central nervous system are being created. If the body is not provided with the materials for this process, one may wonder whether the child's potential can be normal. Also, one hypothesis has it that protein is necessary for DNA synthesis, and that this in turn is related to memory potential. All this puts the spotlight mainly on the mother; there is evidence from a number of countries that women tend to suffer more from malnutrition than men. In some communities, the girls are fed after the boys and men (a tradition which survives in many working-class families in advanced countries) and in any case women need more iron than men. An enquiry into the health of university entrants in Ghana showed the women students to have an average haemoglobin count of 72, as against 92 for the men. The first point to be made then is that many babies are deprived even in the womb, and are weak from birth. In the developing countries the infant mortality rate is very high, and this is one of the factors influencing parents to have more children than is (from several points of view) desirable. Women are debilitated, even further than they would be in any case, by repeated childbearing, and the standard of health of each succeeding child is likely to be poorer than that of his predecessor.

For those children who survive, the weaning stage is likely to prove a further period of trial. The nutritional state of the breast-fed baby is a relatively happy one, but this comes to an abrupt end, when his mother is pregnant again. The baby now finds himself left to crawl on the ground, where he can pick up all the ailments from which he has hitherto been kept apart, especially dysentery and parasites. Instead of his mother's milk he probably now has a diet largely deficient in protein, and administered in an unsystematic and unhygienic fashion. When the new baby arrives his physical hardships are compounded with an emotional trauma, as the mother must now devote most of her attention to the newcomer. All the first three or four years of life are difficult, but the weaning stage is a special period of crisis, which many children do not survive. (The current figures for infant mortality in developing countries are substantially higher than in the advanced countries - approximate figures range from 100 per 1.000 live births to 200 or even more).

The evidence available points to the conclusion that although a child in a developing country may weigh about the same at birth as one in an advanced country, and may develop in approximately the same way during the first few months of life, he soon ceases to keep pace after weaning. The preliminary findings of the studies discussed by Dr. Canosa seem to indicate an intellectual disadvantage accruing, as well as the physical ones which are measurable and the psychological ones which can be inferred. As the work reported by Dr. Dan and his colleagues shows (see Part II.), by the age of three, many African children are a year behind three-year old European children in both physical and intellectual development. One may also put forward parenthetically at this point the interesting hypothesis that a law of 'the survival of the unfittest' may operate during this stage of a child's life: the body adjusts itself to under- or malnutrition by not growing, whilst a body which grew normally would pose unfulfilled nutritional demands.

In all this, one has had to refer to children as 'pre-school-age' rather than as 'pre-school', because in many developing countries there can be no presupposition that all children will have the chance to go to school. There can certainly not be any presumption that more than a tiny minority of children will attend any form of pre-school educational institution (crèche, nursery class or kindergarten). Most of the information available about this age-group is therefore based on clinical experience, and is in any case concerned more with measurable physical factors than with recording typical intellectual development. When one considers children of school age, the situation is certainly better. It is now possible to obtain some data on both physical and mental development of a large number of children within a relatively controlled institutional environment. One is no longer dependent on very limited data regarding children attending clinics or admitted to hospitals, but in some cases one can obtain various forms of data regarding children which will be relatively static geographically and who can be classified according to the other variables likely to be relevant - father's occupation, birth rank, proximity to market, etc. Some difficulties remain, of course. Even the most advanced of the developing countries do not have a nation-wide system of obligatory birth registration; primary education is not yet compulsory in most countries; where many parents are illiterate it is not possible to obtain supplementary sociological or economic data by written questionnaire. Perhaps the most significant difficulty in approaching the 'school-age' group lies in the probability that precisely those children whose educational progress one wishes to observe, namely those suffering acutely from malnutrition or diseases, will be missing from any sample studies in a school.

Subject to these limitations, one can look at the educational effects of malnutrition and diseases from three points of view: those on the child's potential, on his performance, and on the duration and continuity of his education. In the category of effects on potential, one would include those effects which were permanent and irremediable, such as the brain damage caused by severe undernutrition or prolonged protein deficiency at a critical developmental stage; the damage due to iodine deficiency or iron deficiency, and those handicaps which are purely physical in nature but which permanently reduce educability in normal schools in countries which do not yet have enough special schools for various types of physically handicapped children, e.g. blind or poor-sighted, deaf or partly-deaf. In the category of effects on performance one would include not only all the phenomena already mentioned, but also all forms of disease (i.e. most!), which have a general debilitating effect on the sufferer and may give rise to the apathy which prevents him from measuring up to the norms laid down by his country's school inspectorate or by the writers of syllabuses

of text-books. As regards continuity and duration of school, one should note first of all shorter absences caused either by illness or debility; then longer absences caused by prolonged illness or hospitalisation; then repeating made necessary either (through explicit regulation) by the amount of absence or by an academic failure due to apathy or absences or discouragement. Unfortunately, precise data have not been obtained in most countries regarding either the extent or the causes of intermittent absence, but a number of countries have information on drop-out and repeating, which has been referred to in the previous section.

In the country reports presented to the Unesco Seminar on Educational Wastage and School Drop-outs, held at Bangkok in 1966 (1966, III.), most governments referred to ill-health as at least a contributory cause of wastage. Thailand, for example, reported that "malnutrition and poor health result in irregular attendnace and failure in examinations"; whilst the Philippines government concluded from a large-scale investigation that 9% of dropping-out was caused directly by ill-health, and that in a further 20% of cases, ill-health was the cause of frequent absences and ultimately of dropping-out. From Northern Nigeria results of a study of chronic learning difficulties in primary schools were reported to the Conference by Sister Halligan. The study concerned 641 children with poor achievement in the basic subjects of language and arithmetic, and the following factors were identified as responsible for educational retardation:

Defective vision	21%
Defective hearing	12%
Crippling and other physical defects	17%
Behavioural disturbances	13%

General debility and absenteeism due to malnutrition and disease must certainly be included in the unspecified causes in the remaining cases.

A further point should be made with reference to educational wastage: it is surely not without significance that in most countries both drop-out and repeater rates are highest in the lowest classes of the primary school, which correspond with the ages of greatest susceptibility to malnutrition and disease. One might say rather crudely that the longer a child lives the more likely he is to survive; and this general rule applies to the first years of schooling as well as to the pre-school years. Resistance and adaptation both continue from the crisis period of weaning through to the age of nine or ten, but one could regard the first year of school, with its many demands (psychological, physical and intellectual) as a period of special trial, comparable in certain respects with the weaning process in infancy.

Many of the factors which go to make up the complex interrelationships of disease and education are in themselves interacting and in some cases mutually reinforcing. Malnutrition, of course, reduces the child's resistance to many diseases, and certain diseases (especially parasites) contribute to malnutrition. If a hospital presents information about the causes of death or the ailments from which children suffer, it is obliged to state a single cause when in fact the causes are multiple in many, perhaps most, cases. The same applies in the child's psychological state. If a child is suffering from either a specific form of inadequacy or a general debility, he performs poorly at school. His poor performance gives rise to discouragement which reinforces the 'normal' apathy. Some absences caused by physical factors may well be supplemented by other absences caused by psychological attitudes. From several advanced countries has come evidence that children who have once repeated have

a disproportionate tendency to repeat again later in their school career. If the same thing is true in countries where schooling is not compulsory, one would infer that such children will also tend to drop out. Repeaters will obviously also tend subsequently to be rather older than their academic peers, and a certain amount of evidence has become available that this tends to lead to inferior performance.

2.3 Long-term Repercussions of these Effects

In any analysis of long-term effects of malnutrition and disease, one should probably start with a reference to those effects which are known to be permanent in their physical nature or their social ramifications. It is known that the effects of under-nutrition at a certain period of childhood can include permanent brain damage, likewise those of protein deficiency. The effects of iron and iodine deficiency can also be prolonged. Clearly, too, damage to eyes or ears, caused by either vitamin deficiencies or certain parasites, is virtually impossible to put right in the majority of developing countries, which lack facilities for an adequate general medical service and are all the less likely to have personnel or facilities for ophthalmic surgery (for example). The crippling effects of certain other parasitic afflictions are likely to persist even if the parasite itself can be eliminated; and amoebic dysentery is a good example of an ailment which is extremely difficult to eradicate. Some ailments such as dysentery and malaria are so widespread and persistent that they might almost be described as a part of the permanent environment. If a person conquers an attack of diarrhoea or malaria by the appropriate drugs, it may be only a matter of weeks before he succumbs to a new attack, since the organism which cause the one and the mosquitoes which spread the other cannot be eliminated without large-scale sustained effort. Finally, a brief mention should be made of the social consequences of having suffered from leprosy; even the 'burn-out' leprosy victim is unwelcome in society at large and is thus deprived of any chance of making a contribution to its wellbeing by exercising those (perhaps most) of his faculties left unimpaired.

After these general introductory remarks, one might consider long-standing repercussions from three main points of view - those of the population at large, of the employed section of the population, and of adult women. In the developing countries, as might be obvious, the big problem is that of bringing about 'development' on all fronts simultaneously - industry, agriculture, transport, education, health, administrative services and political institutions. In the execution of these tasks, it is desirable that the capacities of the whole populace be mobilised as effectively as possible, and this cannot be so if a substantial proportion either is incapacitated through illness or physical handicap or is unable to give of its best because of general debility or apathy.

This statement is just as true of village women, whose task is to fetch water, keep their compounds clean and see to their families' general welfare, or of self-employed workers in the small-scale traditional economy, as it is of people in regular paid employment in the modern sector. The modernisation of the rural economy, the development of new social institutions, and the evolution of a generalised culture incorporating the best of tradition and of the twentieth century, all demand the participation not just of a minority of 'activists', but of a whole people making a concerted effort. It is obvious that the effort will be inadequate if those of whom it is required are sick or lame or lack stamina; it is perhaps less obvious that the mental attitude must be positive, indeed vigorous, and that sickness and malnutrition can sap the will as well as the body.

As far as the purely educational aspect is concerned, illiteracy is often regarded as a major obstacle to development of all kinds. Through printed materials, a literate adult may be persuaded, informed or brought up-to-date in a vocational skill; he may become a participant in an educational process leading not only to an improvement in the quality of his personal life, but also to the modernisation of his community. The illiterate can certainly be educated or re-educated in certain directions, but there are limits to what can be achieved through the spoken word if it is not supported by supplementary or reinforcing documentation. Furthermore, the spoken word tends (if it is to be effective) to be expensive either in terms of man-power (how many itinerant extension officers, health educators, community development workers can a poor country afford to employ, even if they were available?) or in terms of technological investment (TV or radio transmitters and receivers). Hence the emphasis on expansion of school education, as being in the long run the most efficient method for rapidly increasing the nation's stock of literate citizens, and hence the importance of wastage as a measurable indicator of malfunction in the school system. In the 'Third World' as a whole, although the proportion of illiterates may be falling (owing to the massive expansion of school provision and the death of old people who never went to school a generation or more ago), the total number of illiterates is actually rising, partly owing to high birth rates and partly owing to the very large number of children who drop out from schooling before having crossed the threshold of literacy.

With regard to the employed adults in the modern sector, some of these same points may be made, but with even greater force. The modernisation of agriculture, the diversification of industry and the evolution of a modern form of political and commercial administration all demand personnel capable of undergoing training in the use of relatively complex machines or methods. For these purposes literacy is not enough; a sound general education and a grounding in mathematics and science are often also required. This is not the appropriate place to debate the desirability and feasibility of the sort of changes which are to take place in the conduct of agricultural enterprises or in the size, nature and economics of industry, but it is a fact that the economic gap between rich and poor countries will continue to widen unless changes take place, and that certain kinds of change will occur whether they are welcome or not. This process of change imposes demands on the educational background of the workers being trained for it. It also demands a capacity for a different approach to work itself. Even the agricultural worker on a modern farm works to a less flexible routine than his predecessors, but people in factories and banks have to comply with a strict regime. As a (rather extreme) case in point, the old-style rural roadmender could work at his own pace, more or less, and could even take an hour or two off if he felt unwell, and if he took a whole day off this was not a very world-shaking matter. His modern replacement, however, drives a massive machine which he has to control with steady nerves and hands. Carelessness can be very expensive; the steel monster demands expert maintenance, and time off means large capital investment standing idle. This organised, sophisticated world has only subordinate places for the sick, the crippled, the tired or the apathetic, at least as far as the sector of wage-earning employment is concerned.

A special word has to be said about the long-term significance for adult women of the malnutrition and disease from which they may have suffered. Of course certain forms of disease may be transmitted direct to the children they bear. Also, if the mother is ill-nourished then there is a likelihood that her child may be born puny and develop unsatisfactorily. In some cases there is evidence of long-lasting

disadvantage to a child on account of his mother's having been in a poor state of health even before his birth. Psychologically speaking, there is cause for concern if women are in poor health during the years of child-bearing. Miscarriages or the bearing of puny children may occasion anxiety which may have long-lasting effects on the mental health of the mother. Finally, one should perhaps refer again to the potentially very important role of women in the social sphere. Of course women in the developing countries generally work very hard, often at arduous manual tasks on fields or plantations or in the market-place, and their involvement in such tasks reduces in any case the amount of time and energy they can devote to their children, even to a new-born one. If to these burdens one adds the unremitting handicap of ill-health, it will be appreciated that the infant may well lack care and attention just at the period when he is most in need of it if he is to survive his own developmental crises unscathed.

2.4 Interaction of Malnutrition and Diseases with Other Factors in the Economic, Social and Cultural Situation

In all that has been said about the effects of malnutrition and disease on educational development, attention has mainly been focussed upon direct effects, some of which are measurable. Yet it must be acknowledged that in many cases the interaction of nutritional and medical factors is complicated by the presence of many other factors, often not readily measurable in a way that might facilitate the identification and isolation of those parameters which are of immediate concern in this report. Many of these other factors have the effect of closing a vicious circle, or are, like some of the forms of malnutrition and disease themselves, mutually reinforcing.

The first and most obvious of these other factors is probably poverty. If one had a world map showing the incidence of malnutrition, and another map showing disease, one would be struck by the marked correspondence between the incidence of these phenomena and the incidence of poor educational development on the one hand and a low (per capita) gross national product on the other. Very large regions would demonstrate these correspondences. But there would be a few remarkable exceptions (to prove the rule, one might say!). However, if the maps were to provide a refined differentiation of categories, one would see so many slight deviations from the generalisation that one would perhaps be forced to the conclusion that the tempting syllogism, poverty --- malnutrition --- poor education, will not stand close scrutiny.

There are one or two countries which are relatively wealthy, to judge from their GNP but whose citizens have not yet reaped the benefit of national prosperity: wealth may be based on the exploitation of a highly profitable resource using imported capital and perhaps also foreign skilled man-power. There is a time-lag between the acquisition of national wealth from (for example) oil and the acquisition by the general population of improved standards of life. Nevertheless, one might well retain the subjective impression that at the individual level, poverty is a factor which, if it does not necessarily cause, at least tends to inhibit the conquest of malnutrition and disease. If a man lives in an inland village, in an area subject to tsetse, then meat, fish and milk are all likely to be either unobtainable or beyond his financial means. Or a country may contain areas where the economy is modern, based on mining or manufacture, where many workers are in regular receipt of wages, however modest, and other areas of traditional non-wage occupation, where most of the people grow their food and have little cash for supplementary purchases. In the former areas, those workers who are in regular employment may be fortunate in comparison with those who seek for work and do not find it, and who have to subsist as best they may

on social welfare benefits (if any) and on casual earnings. Even in areas of traditional farming there will be variations of experience: some areas are devoted to cash crops, subject to vagaries of climate, to attack by pests or fungus diseases and to fluctuating world prices; whilst others may produce diversified crops and provide their farmers with an adequate and varied diet in relatively healthy conditions.

While on the subject of general prosperity, one could refer to the question of population. Many of the developing countries have high rates of population growth. Even while they are making rapid strides in their general development and achieving notable increases in GNP, the increase in the number of mouths to feed drastically reduces the net impact of economic progress. If the GNP of a country has increased by 3% and the population has increased by 2%, then the per capita GNP has increased by less than 1%. And if the growth in national product is largely due to profitable oil-wells or copper mines, then the people in other regions may well be even undergoing a decline in their standard of life thanks to population growth.

The question of population leads to the question of population distribution, which lends significance to certain other factors in the situation. Population distribution in many countries demonstrates wide extremes of density. On the one hand there may be relatively small numbers scattered over a wide area (the extreme case being nomadic groups). For these people access to medical care may be very limited, and if the diet is unbalanced then this is likely to be a permanent state. Roads may be poor, so relief from outside will probably be slow to arrive in case of drought or flood, and even if communication by radio may in some ways facilitate cultural change, problems of transportation may inhibit changes, however desirable, in dietary habits. On the positive side, it should however be noted that a sense of permanence, and of 'belonging' to a relatively stable community are conducive to both self-help and mutual support. In many places, too, natural supplements to diet are readily available - wild creatures for protein, wild fruit for vitamins - whilst the stability of the community ensures the viability of a regular market for produce.

In the towns, on the other hand, the pros and cons are of a different kind. It is true that medical services are much more readily available and probably broader in scope, and that the market is probably a large one offering a great variety of foods. On the other hand, towns tend to be harsh and unwelcoming, and the presence of official welfare services may be offset by a lack of neighbourly support for the transient or the unemployed. Even the employed person has to pay for lodging and for travelling to his work, and most things in the market will cost more than in the areas where they are produced. Town and country differ, too, with regard to hygiene and sanitation. Pipe-borne pure water supplies and effective sewage-disposal systems may be uncommon in country villages, but snakes will keep down rats, birds will keep down insects, and the 'bush' is extensive enough for noisome accumulation of sewage or refuse to be rare. In the planned parts of the towns, pure water and organised sanitation may exist, as well as access to clinics, and perhaps also a government or municipal service of insecticide spraying to harass the malarial mosquito, but in the unplanned 'shanty-towns' which grow up on the edge of capital cities the conditions are often as bad as can be imagined, with children exposed from the earliest age, both in the home and in the spaces where they play, to every conceivable threat to their health - stagnant water, rotting refuse, sewage, flies, rats, tetanus, malaria.

All these are factors impinging on the physical situation of the people, and in addition there are certain social or religious or cultural factors which affect the competence or the readiness of people to undertake change. As regards malnutrition,

there are certain traditional dietary habits, which may indeed have a logical origin but which are detrimental to health. For example, in some communities the man is served first, then male children, then the womenfolk: economically speaking, this is often quite reasonable, since the man is the provider and his sons are the future providers, and they must therefore be kept healthy if possible - but as has been mentioned, the health of the mother is of great importance too. Again, the Muslim abstention from pork has a sound foundation: the pig is often host to dangerous parasites. But certain food habits or tabooes are based on reasons lost in antiquity and in some cases are not far removed from mere superstitions, e.g. the belief in certain communities that a child should not be given eggs. In more modern times, the kinds of food available may include imported foods which are high in price and low in nutritive value, but which enjoy prestige because they are preferred by educated expatriates (technical assistance consultants, etc.). Finally, traditional rituals are not always as hygienic as one would like, however innocuous or even beneficial they may be from other points of view; and in some communities it is very difficult to bring about change because of the conservatism of the people or the resistance of local personalities, who oppose the institutions of change which threaten their own influence and authority. These factors are not always easy to identify, and the attempt to analyse or identify them may lead into situations difficult for uneducated people to understand. To persuade a mother to wash a baby's napkin, but not to do so in a stream used as a source of drinking water; to encourage people to wash often, but discourage them from bathing where bilharzia flourishes; to explain the difference between a stagnant pool and a well is not easy.

2.5 Available and Desirable Means of Measuring Effects on Education of Pathological Physical Conditions

The second section of this part of the report dealt with some of the effects of malnutrition and diseases upon the educational development of individual children; this section should therefore be concerned rather with general educational outcomes. The main problem arising is that although a large quantity of data is available about the medical history of children and about the educational situation of children in schools; and a certain amount of educational information is obtained marginally in connection with children in hospitals or attending clinics, there is a serious lack of data illuminating the medical and educational situation of children who are not ill enough to come under clinical surveillance, (or who die in rural areas from causes not specified) or who do not attend school.

Adopting the chronological sequence used earlier, one might refer to the studies carried out in Guatemala (Part II, 6), Dakar (Part II, 8), Ibadan (reported in the paper submitted to the meeting by Dr.Boyd) and elsewhere. By and large, such studies relate to the medical aspects - from them it is possible to draw inferences regarding the effects of severe malnutrition upon physical development or regarding the effects of certain diseases or conditions upon a child's psycho-motor reactions, sensory perception and so on. If the child is not yet of school age, one cannot draw many worthwhile conclusions regarding educational effects, since his performances are not recorded side by side with those of normal children. Nor can one make appropriate allowance for the several other factors which may affect different children's performance in different ways. Nevertheless, it would not be true to say that no means exist for attempting to obtain objective data, only that the data are incomplete. Within the limitations of personnel, time and resources for analysis of data, it is probably both desirable and possible to obtain data which are both

relevant and indeed valuable, provided that whatever data are obtained, are obtained in a fairly standardised form so that they can be collated with properly comparable findings from other populations. One must face the fact that a large-scale longitudinal study is a very expensive operation, but that the collation of relatively inexpensive investigations, such as those done at Dakar in a clinical context, together with perhaps small-scale 'sample' enquiry into normal populations, could be rewarding. Some steps should be taken towards standardisation of whatever tests or measures are used.

As regards children at school, more information could be obtained than is in fact done so in most countries. In many countries the most urgent need may well be for elementary 'base-line' data about children being admitted. In order to establish on a scientific basis the relationships between medical conditions and educational performance, one really needs to establish norms on the basis of more or less representative groups of children, rather than on the basis of children who are sick or of the children in the upper part of the school. So the moment of admission is of crucial importance for the gathering of elementary data on age, height, weight, etc., which might well be supplemented, in localities where appropriate personnel were available, with certain other data such as blood count, presence of bilharzia, malaria, etc. The annual repetition of whatever tests were feasible would in itself provide useful data on physical growth and the incidence of certain conditions in a 'normal' population. This information would then need to be studied in conjunction with information on scholastic performance which itself needs to be obtained in a more systematic way than hitherto. To what extent are the parameters really measurable? The list might read something like this:

apathy
low concentration
lack of motivation
low achievement
absenteeism
dropping-out
difficult relations with teachers or fellow pupils.

Certain of these indicators are obviously measurable in an objective way, but certain others could be measured only with difficulty and by skilled research personnel. One needs therefore to concentrate on those elements which can be measured accurately and reliably by teachers without special training. It might be said, in the light of the second section of this report, that measurements were already being made of dropping-out and low achievement. However, if one looks closely at the sort of information available in the statistical returns of most countries (even including some relatively advanced ones), one realises that objective measurement of academic achievement is rather exceptional, and that even though the figures for dropping-out may exist, very little objective evidence exists to show the immediate cause of dropping-out, to say nothing of the indirect causes. On the positive side, it would be possible fairly soon to correlate the incidence of certain medical conditions with dropping-out and repeating, but a big gap exists in our objective knowledge of academic progress, since most school examination papers are set by examiners working to their own or traditional norms, and results tend to follow a traditional pattern. It would be useful to have norms based on standardised attainment tests - these would have an intrinsic value for the control of repeating, for example, in addition to their value for establishing the relationships between medical and educational factors.

As regards absenteeism, some information probably exists, but teachers do not normally attempt to ascertain (and record) exactly what was the cause of a child's absence. It might be possible to obtain more detail in at least a sample of schools.

In spite of what has been said, one must acknowledge the real difficulties confronting any attempt to refine the information now available. Many countries do not possess the trained personnel for any sophisticated investigation on a large scale, and in many places one cannot rely on untrained or inadequately trained teachers to supply even basic school statistics on enrolment and attendance accurately. It may be over-optimistic to suppose them able and willing to obtain details of the kind required. In most secondary schools, and in some selected primary schools, the outlook is brighter, but on the whole one is sceptical about the likelihood of progress except when investigations can be conducted in selected schools under the close supervision of trained personnel (e.g. inspectorate, university researchers or teachers' college staff.

Even when an enquiry is carried out on a fairly small scale, with careful planning and supervision, it may produce only inconclusive results. This is especially the case where almost the whole population is found to be suffering from malnutrition or enteric disorders or malaria or bilharzia, so that any variations from the mean of academic achievement are due to individual differences or unascertained other factors. For example, an enquiry into the academic performance of sufferers from bilharzia proved largely inconclusive because virtually all the children studied were infected with bilharzia (see Usborn's report, 1954, 11.). If an uninfected control group is not available, one can hardly draw conclusions about the educational effects of the infection. One also comes up against the almost insoluble problem - whether the effect on academic attainment of the absence of a child who goes to a clinic for treatment or who goes to bed for a rest is greater or less than the effect of remaining in class while suffering from a condition rendering him 'under par'.

3. THE ROLE OF EDUCATION IN THE FIGHT AGAINST MALNUTRITION AND DISEASES

3.1 Education of Children Below School-age

The preceding section will have made it clear that the phenomena of disadvantage can be viewed in more than one light, inasmuch as they comprise the effects upon the body and its welfare and also the complex and often not readily measurable effects upon intellectual capacity, academic achievement, social participation, and the contribution of individual citizens to the economic and cultural progress of their nation. In the same way, the battle against malnutrition and disease can be fought on more than one front. The obvious weapon against malnutrition is the improvement in quantity and quality of food supplies, and the obvious wapon against endemic diseases is modern medicine - prophylactic drugs and the proliferation of clinics and hospitals. But in both cases an extra dimension has to be mentioned, that of education.

The extension of the area under the plough; the development of high-yielding strains; the increase in efficiency of agriculture and fishing; the improvement in diet; the adoption of measures of family planning or preventive medicine; the right location and utilisation of clinics - all these actions demand popular comprehension and participation if they are to be permanently successful. It is significant that international organisations such as FAO, WHO, UNICEF and voluntary bodies concerned with action

of the kinds mentioned all devote special attention to the educational aspects of their work as well as to the propagation of technical advance; and that governments now realise the need to set up machinery for communication and self-help at the same time as they set about the distribution of food or the institution of medical services. Worthwhile lessons have been learned from those instances where a mechanism has been set up for solving a concrete problem without any accompanying provision for long-term education. In Ghana, for example, the Nkrumah government set up 'builders' brigades' and state farms with the intention of extending and diversifying production, but they were not a success because many people were accustomed to regarding the government as a universal provider, and needed to be educated to an acceptance of this new idea of government as merely opening a door for self-help. Another African government (Tanzania) is currently having to revise its ideas on how to train young farmers, for somewhat similar reasons.

Consideration having been given to the impact of malnutrition and disease at the various age-levels and according to the institutions with which a person becomes formally involved, it may be useful to follow a similar plan when looking at the role of education in combating these afflictions. As far as the young child before school-age is concerned, one should perhaps think of him together with his mother, since throughout a large part of the first five or six years of his life he is not subject to the influences of any formal educational institution, and since in any case it is the mother who is the dominant influence as regards nearly all the factors that matter to his life and health. What educational influences can be brought to bear upon the mother at the very time when she is pregnant, before the child is born and during the dangerous period up to and beyond weaning? On the face of it, one may expect the depressing answer to this question to be - none, since in many countries the woman continues to carry out her routine tasks of cooking, cleaning, fetching water, etc., with little or no time (even if the facilities existed, which generally do not) to improve her knowledge of how to sustain and keep healthy her own body and that of her child. Even in those countries where educational advance has been rapid, the girls have generally benefited far less than the boys, and in many rural areas one therefore finds a majority of women either ill-educated or even illiterate. So the printed word is not likely to have a significant impact. However, one does find women, in both town and country, living a life in which the day's work can be planned to afford some time for social contact. This is the time when a community development worker ('animateur') can hold a short class in which the women will be pleased to learn how to knit or sew and will acquiesce in learning at the same time a little about nutrition, hygiene or child care.

The learning in such situations can be, indeed must be, of a very practical kind, and some of the most successful undertakings of this type have been where a social group already existed and where the learning has arisen almost spontaneously out of the group's need to conceive worthwhile occupations for itself. For example, social gatherings in the village community centres in Mauritius became occasions when a volunteer nurse or at least a well-educated woman could come and talk informally about nutrition, child care, hygiene, etc.; in Senegal, the village women were taught how to keep poultry and given practical help in organising this activity, as a profitable hobby at first, but later as the beginning of nutrition education. In fact, linking an educational process with some activity which is patently profitable in a more material sense may in many cases be the only really effective approach. In certain villages in Uganda, the personal pride of people in the appearance of their homes became chanelled into an effort for the cleanliness of the village.

It may be worthwhile to quote also the manner in which medical treatment may be associated with medical education. The health centre at Kibaha in Tanzania provides medical treatment, but the centre is adorned with illustrative material of a type comprehensible even to illiterates, and all treatment is accompanied by a little homily. In-patients are fed on a rational diet and informed of its constituents (which exclude sugar). In all this, special attention is paid to women, and particularly pregnant women who come to pre-natal clinics and who are in-patients for a time.

In towns, or in rural areas in these countries where progress is being made in the overcoming of illiteracy, these kinds of education for adult women can be supplemented by more sophisticated approaches: education by television 'viewers' clubs' or radio 'listening circles', articles in newspapers and magazines, public lectures.

As far as most of these activities are concerned, one may presume that the tiny child will be both involved and affected. Only through the education of the mother can one anticipate achieving an impact on the nutrition and health of the baby and the toddler. As regards the older pre-school child, clearly more needs to be done (although most developing countries cannot afford to do much at present) in the direction of play-groups and nursery classes. Even if only conducted on a part-time basis or by the use of voluntary helpers, such institutions could play an educational role for at least some children, and even if only the children of more prosperous parents (and only in urban areas) derived benefit, the lessons learned might in due course percolate through to other strata of society or other areas. The lessons learned would be not only those of social mixing and regulated behaviour but also those of cleanliness, preventive medicine and (if any food were provided on the premises) nutrition. Even if nothing were learned by the child, the regime in itself would be of physical benefit as long as he was subject to it, and perhaps also afterwards.

3.2 School Education

In both advanced and developing countries, it is probably true to say that the school is the most appropriate and the most effective means for changing attitudes and teaching essential facts. It may not be the most appropriate machinery imaginable: ideally, one would like to see a network of community centres, nursery schools, youth clubs and so on in addition to what is described as school, and a system of mass communications, (radio, television, newspapers, magazines, public libraries, lectures), organised to interlock with the educational policies and programmes of all these organs and institutions. However, with all its limitations, the school does provide an institutional base for an effort which is aimed at a specific sector of the population, relatively homogeneous in age and interests, relatively stable in its geographical location and its composition, and accessible at known times and for a reasonable length of time. Finally, and of vital importance, the school is concerned with the young, on whom the society of tomorrow will depend for definitions of its habits of behaviour, culture, nutrition, hygiene and medical care.

First, the school can undertake direct action to alleviate the immediate causes and major symptoms of both malnutrition and disease. Many children suffer from malnutrition because they are not fed often enough or substantially enough, and simply do as best they can to fill a painful void, often with carbohydrate food with little nutritive value. The school is a place where activity is relatively disciplined, and where in consequence a possibility exists to bring order into the child's own

arrangements for his own feeding at midday. He can be told what kind of food to bring with him, or control can be exercised over the sort of food he buys. In some areas, it has been known for a school head to watch over both the price and composition of food cooked and sold by some local woman at the entrance to the school compound. In other cases a local market trader has been encouraged to come and sell for a low price some article of known nutritive value such as bananas or peanuts. These measures are possible even in rural schools. In urban areas where local authority finances perhaps are stronger it has proved possible to make a start with a school meals service. Even in towns it is perhaps not sufficiently appreciated that many children have a distance to travel and do not have time to go home at midday (in any case they may not get a real meal even if they do go home, if the father is out all day and has his main meal in the evening). In such circumstances it is possibly both sound dietary sense and sound economics for a large-scale catering scheme to be operated. Such direct action should always be accompanied by efforts at information: a number of instances are known, in which children were given a reasonable midday meal, but were not informed about the rationale of costs and nutritive values according to which the menus were drawn up. Cases are also known of residential institutions adopting for reasons of prestige a menu based on European models, in which expensive imported items were used in preference to cheaper and readily available local materials. In such cases, once a prestigious dietary pattern is established, change is difficult to bring about without the risk of student protest.

In addition to the provision of meals or the control of foodstuff available to school children, the school can, if it has a garden, play a useful part not only in the feeding of the children but also in their nutritional education. Children can not only be taught (for example) which vegetables have nutritive values, but they can also learn how to produce bigger and better crops, how to care for poultry, etc. If there is a school canteen, some of the garden produce can itself be used to supplement purchased materials. Many countries have encouraged school gardens, but unfortunately the crops have often been of a traditional kind and the methods also have been old-fashioned, so the opportunity has been lost to teach new methods and the uses of new crops; then often the crop has simply been sold for cash instead of being put to direct use by the school itself.

These comments will have made the point that what is needed is not only an improvement in children's diet, but also to teach children about the importance of diet and some of the basic principles of nutrition. These things will not necessarily be taught effectively if they are presented in a so-called 'nutrition' lesson and are not referred to in other lessons: the scientific principles can come into the science syllabus; local dietary habits can be discussed in 'civics' or 'current affairs'; local products can be mentioned and assessed in geography lessons; and both facts and opinions can be brought together in number work, language work and in the practical applications observed in the running of the school canteen or the school garden.

Somewhat similar comments could be made about the approach to hygiene and health. The school has good machinery for inculcating sound habits of hygiene, but its efforts will not be successful if there is a marked cleavage between theory and practice. Children should be taught the value of personal cleanliness, but it is not much use to teach this in a hygiene or science lesson if there are no bowls of water available for hands to be washed after a visit to the toilet; it is not convincing if one teaches the life-cycle of a mosquito in a school where stagnant puddles abound. Nor are the hygiene or science lessons the only times at which teaching of

health rules can be undertaken. The enterprising teacher can make opportunities for himself to introduce useful nutrition and health education into reading lessons, current affairs and so on. This is not just good education - it is also sound economics, if absenteeism and repeating become reduced thereby. Unfortunately, in many countries a large proportion of teachers, especially at the primary level where the deepest impressions may be made upon the greatest number, are either untrained or inadequately trained. A great responsibility therefore rests upon the inspectorate and the training colleges to carry out the global attack mentioned above. In particular, those inspectors or college lecturers who are particularly concerned with either nutrition or health education must see that nutrition and health are interlocking and be aware that successful education in these fields (or rather, in this combined field) demands an effort in other 'subject' fields and in the general running of practical everyday affairs in the school as a whole.

3.3 Informal Adult Education and the Rôle of Mass Media

Action in the community at large will often be initiated in the school, which in many communities can be the spearhead of change. In many rural areas especially, the teachers, if they are trained, are the most educated members of the community, and are well placed to set an example to the other citizens in the way they live. Whereas in most advanced countries children learn from their parents, in the 'Third World' it often happens that children are better educated than their parents and are able to teach them something new and useful about food and health, and perhaps even about how to obtain bigger or better crops. Even where no formal machinery of adult education or community development exists, it is inevitable that the school, as a community in its own right, will exert its influence for change on the wider community which it serves. So not only is there an intrinsic significance in reformed school curricula, but the school is itself the vehicle of modernisation. Unfortunately, few ministries of education have appreciated this fact so far, at least as far as one can judge from the content and methods of teacher-training. An interesting exception to this generalisation is the teachers' college at Yaounde in the Cameroon Republic, where teachers are being trained to be not only teachers but also leaders of community action outside the school: it is part of the explicit mission of the school to act upon its environment.

The school has been mentioned before the community development service, because in most countries this latter has usually only inadequate resources at its disposal, whereas the formal primary or secondary school is part of a large network to which importance is attached. Nevertheless, tribute must be paid to the valuable work done by the community development service ('animation') in many countries. In general, there has been a recognition that much can be done with small resources if only the interest of the people can be captured, and that often the most effective way to set a lively movement going is to arouse an enlightened self-interest rather than to rely only on exhortation. For example, to advocate the consumption of eggs in a village where poultry is not bred is not very helpful; but to teach a group of villagers how to rear chickens, what to feed them on, and to provide young chicks to start the business, is to prepare the way for an educational process by initiating a sound practical venture. Similarly, when an agricultural extension officer visits a village to give the farmers advice on how to improve their crops, it has often been found appropriate for him to be accompanied by a health worker to talk to their wives about better feeding or child car or village hygiene.

A major problem may be said to present itself in connection with the educational functions of services such as agricultural extension or health service: they are technical services which are generally under-staffed and under-financed even for the effective performance of their technical functions, and one might argue that they should not be called upon to perform these educational functions as well. But in the long run the educational function may be of even greater importance since technical help may engender a spirit of dependence, but technical help plus enlightenment may enable people to stand on their own feet and work towards their own progress with self-confidence and self-respect.

Some programmes of a purely technical nature do, of course, have an educational element 'built in'. For example, if iron tablets or milk is distributed to schools under a WHO or UNICEF scheme, it is inevitable that at least some people will ask themselves what the purpose of the exercise is and perhaps look for new initiatives to take. Or if an authority carries out insecticide spraying to kill mosquitos in a malarial area, then at least some of the people may thus learn of the connection between mosquitos and malaria.

Ascertaining what are the existing interests of the potential clientele is an important task for adult education workers. It is often fruitless, to provide classes in nutrition, child care, hygiene and so on unless these pills are sweetened with a coating of what the people actually want (as distinct from what they need). They may want a literacy class or a sewing class, and this can be what brings a group together, after which the other topics can be introduced gradually. This is particularly true of the educational functions of the mass media. If people switch on the radio it may be primarily with the hope of hearing lively music, but brief anecdotal references to more useful matters can be slipped in between the musical items. If people switch on the television receiver or attend a television 'viewing circle' the main purpose may be to obtain entertainment in the form of drama, adventure or comedy, but brief educational programmes may also be seen with interest. The television and radio producers of some advanced countries have developed a certain expertise in the use of intrinsically entertaining media for the transmission of information and enlightenment (e.g. the use of a serial story to convey information about farming methods, the workings of the law, etc.) and there is scope for a good deal of this sort of work. As far as newspapers and magazines are concerned, the readership may not be as wide as it is in more advanced countries, but the reading is perhaps more avid. Where reading matter is not plentiful and the cost of a newspaper is high in relation to a working man's wage, a brief article on a nutritional or medical topic stands a better chance of being read and taken seriously in Accra than in London. Also, newspaper editors in developing countries are less well provided with copy than their opposites in advanced countries, and so may be pleased to obtain free material from the community development service or the ministry of health, provided of course that it is brightly written. Finally, a capital importance should be attached to leaflets, magazines, etc., produced for reading by new literates. These are the people who are keen on self-improvement and are most likely of all their generation to be receptive to useful practical knowledge. They want to read, and this want can most appropriately be met in the form of reading matter which will help to improve their lives and the lives of their children.

The point to be emphasised in all that has been said with reference to both school education and adult education is that the people concerned with education are not technical experts, and often the technical experts in agricultural extension, health services, etc., are not experts in the use of communication media. There is need

therefore, for the agricultural, nutrition and health experts to inform the teachers and adult educators of the information or doctrines they wish to convey, and for the educators to educate themselves and also to indicate to their technical colleagues which are the appropriate channels and methods. Sociologists and psychologists have a part to play, too, in ascertaining the special problems of information-flow or traditional attitudes, and in evaluating the results of pilot educational programmes. In too many cases, one finds 'field' educators and university-based research workers cut off from each other by walls of prejudice or by barriers of bureaucratic procedure.

3.4 Education of the Handicapped

In a sense, this topic should properly be dealt with in a chapter on its own, since education of the handicapped is not so much an educational effort as an effort on behalf of those left crippled or disadvantaged in some way by physical effects, some of which are attributable to malnutrition and diesease. Nevertheless, one might regard any effort on behalf of the handicapped as contributing to the establishment of a climate of opinion in which the causes of handicap can be sought for and fought against.

The first task is to identify the handicapped in the present context. In an advanced country the term is probably applied to a narrower range than in developing countries, simply because the range of crippling diseases is narrower and because medical services are often such as to deprive many diseases of their worst effects. Reference has already been made to leprosy (now almost non-existent in advanced countries) and to this must be added:

1) blindness or eyesight disorder caused by vitamin deficiency or various parasites
2) physical crippling caused by various parasites
3) mental handicap caused by under- or malnutrition.

Another task is to obtain a reasonably reliable estimate of the size of the problem. In the rural areas of developing countries, handicapped youngsters either do not go to school, or drop out early, so it is difficult to discover how many are involved. With regard to adults, if there is no organised system of unemployment benefit, it is likely that a high proportion of the handicapped either live off relatives or obtain only the most casual employment or even become beggars - again without official records becoming available. The conclusion will probably be, then, that as far as can be seen from the very limited data available, the developing countries have a larger relative number of handicapped people than the advanced countries do, and that relatively little is done for them, either by relieving the burden of handicap itself (by providing spectacles, crutches, wheelchairs, etc.) or by providing a training and subsequent employment within their limitations.

If one thinks first of handicapped children, especially those of school age, the first point to emerge will probably be that little is done for them even by their own families. It has already been noted that in poor communities living at subsistence level whatever food is available goes first to the productive members of the household. This is logical, if harsh. The same logic tends to be applied to the handicapped child. If his present or future economic value (i.e. his usefulness as a fetcher of water or a tiller of the field, or, in more 'developed' areas, as a clerk or technician) is patently limited, whatever affection his family may feel for him as a person is unlikely to be accompanied by special effort to ensure that he gets reasonably fed and clothed, to say nothing of his being educated or trained.

The same may be said at the level of official provision: most developing countries make little provision for special schools or special vocational training for the physically or mentally handicapped, partly because the specialised personnel is probably lacking, but more likely because precious educational resources (building, equipment or staff) cannot justifiably (it would be argued) be employed for the benefit of people whose contribution to the nation's economic welfare is likely to be negligible. This line of argument can be described as a vicious circle; it is hardly possible to change attitudes at the domestic level until changed attitudes at the national and official level have brought about actions leading to concrete demonstrations that handicapped people can be useful, if properly trained to make the best of the faculties remaining to them.

The approach to this problem should be from two directions. First, if a country has adopted universal primary education as an essential tenet of national policy, then it should be devoting at least as much effort to the education of the handicapped as to normal children - in compliance with the Universal Declaration of Human Rights, if for no other reason. Even the most arbitrary kind of calculation could be made to provide some readily justifiable figure for the expenditure involved. One method would be to multiply the approximate per capita cost of primary education for normal children by that number which represented the same percentage of handicapped children as the percentage of normal children attending school. The second direction would be that of economically useful vocational training, either for older children or for adults. Here an effort might be made in the direction of at least partly self-financing enterprises. Since normal people manage to make a living as potters, basket-makers, etc., it ought to be possible to train some physically handicapped people to do work of this kind or to provide some of them with sufficient general education to become accountants, copy-typists, etc. The blind or feeble-sighted could also be taught basket-making or other appropriate crafts using local materials and traditional methods, from which they could derive not only a modest income but also standing and self-respect. The mentally handicapped present a bigger problem in countries where unskilled labour is very noticeably at a discount, but an effort should be made if traditional scepticism is to be overcome.

Unfortunately, this is a field where what has been done has mainly been done by voluntary bodies, especially religious bodies, who often do not take kindly to the idea of pooling resources and working in close collaboration. It is therefore all the more desirable that official bodies, such as ministries of education and labour or departments of community development, should give a lead in initiating a nationally planned effort to enable the handicapped to fulfil themselves as human beings and to become useful citizens. If such a national approach were adopted, the health services would probably be able to integrate into it not only a service for the pallation of human suffering, but also a movement for more generalised education on the causes.

4. PROSPECTS OF FUTURE ACTION

4.1 Rôle of Local Communities in the Adaptation of Education

From what has gone before, it will be clear that education must play a crucial role in the struggle against malnutrition and diseases, and that education in this context is to be understood as mass education - an educational effort directed at

parents and the pre-school child as well as at the school-child. It is necessary therefore to distinguish between mass education and literacy campaigns. Generally speaking, literacy campaigns at least in most of the recent cases have been relatively unproductive, as they have not led to any great change in behaviour of people, especially in connection with nutrition, health or children's education and welfare. At the same time, and in any case, the illiterate person should not be regarded as an ignorant or ineducable person. He has developed his own verbal categories and logic which enable him to assimilate ideas in his own tongue without necessarily having the help of a printed text. The ideal vehicle for this sort of communication seems to be the transistor radio, which is very common among the most isolated families and is listened to with keen interest. Television is too costly for most families but may be of use at community level. With the school as a central base, it would be useful to develop out-of-school clubs and to use film. In all cases, the most effective way of attracting a mass audience is by rational use of mass media.

The introduction of the child into the environment, his adaptation and his receptivity all develop in stages like links in a chain, the strength of each link determining the value of the whole chain. So one has to consider the total development of the child from conception to adulthood. At no stage can the child be isolated from the family or his immediate surroundings, and it is therefore necessary that education be directed both at the child and at the surroundings which affect him.

As far as the pre-school-age child is concerned, it is certainly possible to bring about an improvement in nutrition and health by the provision of food supplements and medical attention and better sanitation etc., but these measures must be accompanied by educational measures, since this is the age when hygiene and food habits may be acquired and may condition future attitudes. The educational effort should therefore be aimed not only at the child, but at the whole family. Educators must be made aware of all the nutritional and health factors which may give rise to pathological conditions harmful to development. In the same way medical personnel should bear in mind psychological and educational problems. A continuous dialogue should be established. In the long term, the most obvious steps required are in the direction of provision of medical supervision and nutritional education in the context of playgroups, nursery classes or kindergartens. However, most developing countries are far from being financially able to establish such systems nationally. For the present, the main effort might be directed towards institutionalising the coordination of work of doctors, agronomists, health workers, educators. This topic will be referred to in the next section.

As regards school-age children, it is clear that health education should probably have a more important place in the curriculum. This enhanced importance of health education should not, however, take the form of extra lessons explicitly devoted to health education as a separate subject, but rather of integration of nutrition and health components into existing subjects. Geography, for example, should include attention to local food resources; civics should include village hygiene; science should place more emphasis on human biology. Where a school canteen exists, an attempt should be made to ensure not only that it plays its part in the better feeding of children but also that it plays an educational role, in fostering better nutritional habits.

In many countries, school gardens exist and are encouraged by education authorities. However, they are in need of expert technical guidance (choice of crop, method of irrigation, etc.) which education staff are often not competent to provide. In some cases, the teachers' lack of competence is accompanied by a lack of interest on the part of

children, parents, and local people. Again, what is wanted is a closer relationship between educators and agricultural extension, community development, health services, so that the school may become an active and integral part of the life of the community, and so that the machinery of education may be reinforced with the technical expertise these other services possess. It cannot be claimed that this kind of co-ordination will be easy: there are psychological barriers as well as the obvious financial and administrative ones. In some areas, professional workers in agriculture extension or community development are envious of the financial resources devoted to formal education or the prestige attached to it; in others they are scornful of the lack of training or narrowness of vision of village school-teachers; in yet others it is the teachers' training which has been of a narrowly academic, bookish kind, thus making it difficult for them to recognise the need for, to say nothing of actively seeking, expert technical guidance and help from outside the education service. On the other hand, the village teacher may well be quite an expert himself in the art of communicating with children. In short, what is required on all sides is a recognition that the child is one with his family and that the school is one with its community.

It would not be true to say that the school on its own is capable of undertaking the nutritional and health education of the community it serves, in spite of its undoubted potential as a spearhead of development and the usefulness of its classrooms as a possible location for community development, agricultural extension or health education. Nor would it be true to say that the sort of information available to health or extension workers exists in a form readily transmissible to children (or even to their mothers). Where, however, an organised system of formal education exists side by side with organised systems for informal education, there is a good case for attempting the local coordination necessary, and some justification for the hope that a family-centred education might evolve.

4.2 Government Action in Establishing Priorities and Defining Policy

Given the present-day methods of training teachers and of administering the educational system, not a great deal of progress along the lines indicated above can reasonably be expected. Teachers are trained for work in the class-room, not outside it; they are not taught about recent researches in nutrition, preventive medicine, etc., and can hardly be expected to be expert in sociological or communications theory as applied to the mass education and community development situation. If durable progress is to be made, then local effort needs to be stimulated and backed up by a rather substantial national effort, which might, one suggests, take three main forms: the training of teachers, health workers etc. to work together, and the production of teaching materials both for teachers' and for pupils' use.

Before any of these things is likely to take place on a large scale, governments have to be convinced of the need. There is no shortage of data on malnutrition and disease, or on educational wastage or productive inadequacy, and some correlations have been established. It now requires little if any further data to establish the explicit correlation, and one suspects that most governments are in fact already convinced. But of course it is administratively convenient (although not very useful from other points of view) to keep nutrition and health on the one hand and education and vocational training on the other neatly divided into their separate administrative and financial compartments. It is true that some governments have an office of planning or of development which tries among other things to ensure liaison and collaboration

between different ministries and departments. However, the first step towards the solution of this particular problem might be the manifestation of a direct interest in nutrition and health on the part of the ministry of education. It is not sufficient just to say that nutrition and health are important and appear in the curricula of schools: what is needed is an office in the national ministry of education in which a beginning can be made in the diffusion of nutritional and health education through the education system. Such an office could be located (in operational, not necessarily geographical terms) either in the section devoted to curriculum or in the section devoted to edcuational planning, or between the two. The officer in charge would be a professional, not an administrative officer, and his first task would be to establish an operational liaison not only with appropriate professional staff in ministries or departments responsible for agricultural extension, health, community development, social welfare etc., but also with universities or international agencies and foundations carrying out research in these and related fields. He would need to obtain relevant data and either produce abstracts himself or obtain summaries from the technical experts concerned, which he would then need to rework into a form comprehensible to his professional colleagues. Statistical data on nutritional factors and on geographical or seasonal incidence of various endemic diseases would need to be re-presented in a form such as to facilitate correlation with educational statistics on absenteeism, drop-out, and examination results. It is clear from the papers submitted to this Conference and from the extent of the Bibliography that a lot of information exists, but that either educators are not acquainted with it, or in some cases it is presented in too technical a vocabulary for it to be immediately usable by average teachers.

An important task of the health education office of the ministry of education would therefore be to present the information in such a way that its relevance was seen and that teachers in the field could base the content of instruction and also the practical running of school gardens, canteens or the school and compound itself upon up-to-date and reliable technical foundations.

Information and expertise need not flow in one direction only. Agencies other than educational ones could benefit from knowing which aspects of their work are relevant to education. They could also profit from professional educators' (especially teacher-trainers') experience in the use of various communications media. This does not imply that (for example) a sister-tutor does not know how to train nurses or that community development workers are lacking in expertise. Quite otherwise! But teacher-trainers and school inspectors do have a long experience of many media and are quickly aware of developments in the technology of communication, so they would have much to offer as well as to gain from the kind of collaboration envisaged. As far as instructing children is concerned, of course, their experience is unrivalled.

It is not sufficient to have information available in up-to-date, relevant and comprehensible form in a ministry of education. Positive action has to be taken to ensure that it will reach teachers and that they will in fact make good use of it.

There are two main channels: the inspectorate and the teacher-training colleges. First, the inspectors and advisors themselves need to be both informed and persuaded. This will only be the case if the health education officer has done a good job of communication. As far as teachers already in the school are concerned, many will probably be content to work on in their accustomed manner, and will be resistant to new demands on their time and energy and skill - the need to reassess their curricula, the need to cooperate with staff of other ministries or with local people, the need to devise new teaching aids and perhaps even completely new methods. Nevertheless, it

may be possible to introduce both appropriate materials and new attitudes through vacation courses, leaflets and bulletins, conferences and of course the visits by the inspectors and advisors, who must themselves demonstrate not only interest and conviction but also, if not expertise, at least familiarity. In this connection, one might suggest that the frequent devotion of part of a vacation course to this material might well prove more effective than one isolated never-to-be-repeated course or conference. The attendance of medical or nutrition personnel at such conferences or courses is probably desirable, but the actual teaching and leadership should come from professional educators: a danger very manifest in the past has been that of encouraging teachers to suppose that such topics as agriculture and health were factors impinging on their life and work from outside - essentially extraneous to the real task of education. What is now needed is an awareness on the part of teachers that food and health do have an intimate connection with education and that their schools can and must interact with the communities they serve.

At the same time, the teacher-training colleges have perhaps an even more vital part to play. Here are the future teachers who may be expected to have lively minds and a receptive attitude, and who have before them at least three decades of professional service. Not only should the curriculum of their training include some familiarisation with the interrelation of health, nutrition and education, but it would also be desirable for them to be brought into contact with workers in the health, agricultural extension, community development and related fields. Consideration might even be given to the possibility of there being common elements in the training of teachers and of workers in these other fields, so that a new generation of professional 'communicators' might come into existence, wishing to impart at least some of the same things, but perhaps by different methods, and to different groups within the community. Teachers in training often carry out their own investigations either in the college's own area or while on teaching practice. A study of the total background of the children they will teach should include considerable attention to their diet, health hazards, endemic diseases and the conditions of hygiene and sanitation in their homes and villages. This sort of study cannot be called research, but it should employ scientific methods and arrive at objective and quantified fact rather than vague generalisation.

For teaching the traditional subjects of 'hygiene' or 'health science' or 'gardening' there exist text-books in most countries. However, what is now called for is a new approach (from the method point of view) and a familiarity with data and research findings which rapidly become out-of-date. It is therefore both unwise and probably expensive to count on being able to buy new text-books often; a suggestion might be that a loose-leaf compilation would be more appropriate than text-books, which in any case are often imported and not directly related to the local scene and local problems. A loose-leaf system could contain various types of material and would have several advantages. First it would contain accurate and up-to-date material on nutritional and health phenomena of the country for which it is intended (omitting those topics which are wholly or largely irrelevant) with perhaps supplementary sheets to cover phenomena of only regional significance. The text should be written in a vocabulary comprehensible to the level at which it is aimed, e.g. in the vocabulary of an average school-teacher rather than of a doctor or a university professor. Supplementary sheets could be issued for the diffusion of new research findings or of interesting new local data. Second, the dossier would contain materials similar to the first kind in basic content but differing in amplitude, presentation and vocabulary, to serve as a direct guide to the teacher as to the content and style of his class presentation. Third, there would need to be detailed guidance to the teacher on the method and

and timing of class-work; on how to obtain or prepare illustrative material (e.g. posters, flannelgraph, specimens, blackboard sketches), and on the sort of practical work or related studies the children might find useful and interesting. Fourth, but by no means less important, the teacher would need guidance on how to establish mutually helpful contacts with workers in other communication agencies; on the organisation of local self-help projects or the collection of local data; and on the application of his and the children's knowledge in a meaningful way to the school environment and to the way the children and their parents live.

It cannot be repeated too often that there is not an acute lack of information (although certain gaps do exist), but rather a lack of effective and permanent communication. If a text-book is out-of-date, partially inaccurate or irrelevant, and tattered, it is no longer suitable for its purpose and is not well esteemed by specialists competent to see its faults. The same would apply to a loose-leaf system which became out-of-date and neglected. So the suggested loose-leaf compilation, for the benefit of teachers, must be looked at in the context of an ongoing renewal of materials and methods, at school, teachers' college and ministry levels, accompanied by a permanent dialogue between formal and informal educators and all kinds of technical services. Research is also an ongoing requirement, but there is a need too for imaginative use of radio, television, magazine features, the composition of 'jingles' and the design of posters, if the attention of the people is to be really captured. This whole movement presupposes a policy orientation on the part of governments (and their provincial administrations too) so that all the machinery of education can be harnessed.

4.3 Action by International Cooperation

In accepting the invitation to participate in this Conference, one member made the comment: "Why has it taken so long for a meeting of this kind to be convened?" Truly, the nutritionists know a lot about the diet of the child, the medical experts a lot about his health, and the educationists a lot about his school performance. But an encounter of this kind, in which nutritionists, pediatricians and educators get together to look for areas of common interest, is a rare event. The first task of international agencies therefore is to recognise the need for a multidisciplinary approach to some of the problems that concern them. Several agencies in particular already possess substantial quantities of data on fields within their normal scope. What is now wanted is not a further short conference, but the embarkation upon a programme of collation and synthesis of the data held in various specialised locations. Some examples are the following:

1) Documentation on the effects of various kinds of disturbance in biochemical metabolism upon the development of the brain (from the point of view of both psycho-motor and intellectual functions).

2) Data on the impact of malnutrition from the point of view of appropriate counter-measures and reversibility of conditions.

3) Assessment of utility of various types of test material available (intelligence tests and sensory perception tests).

4) Data on correlations between nutritional or medical conditions and measures of absenteeism, drop-out and academic failure.

5) Relations between bacterial or parasitic infections and absenteeism, etc.

All this material should be synthesised in such a way as to be conveniently available and comprehensible by nutritional and medical sepcialists on the one hand and sociologists and educators on the other. Much of the material could form the foundation for the compilations already mentioned as being desirable at the national level. Perhaps it should be noted that although a vast amount of material exists, it is often not readily available in government ministries of developing countries, which do not normally have the financial resources for establishing well-stocked specialist libraries. One or two international agencies might therefore do a substantial part of the work of sifting and synthesising required. They might go one stage further, in producing some of the loose-leaf educational material for teachers and teacher-training colleges, or in producing material suitable for radio or television programmes, popular magazines, and other media.

International agencies have a good deal of documentation at their disposal, and they have or can obtain the services of expert consultants in various fields. Some of these experts can help evaluate existing material, and can give guidance to national governments in the collection of local material, in the establishment of liaison units between ministries and in the evaluation of the effectiveness of the various dissemination methods available. The agencies might also set an example in communication techniques in their own (inter-agency) communications. They might, for example, think of establishing an information and liaison bulletin to publicise bibliographic items; abstracts of articles or research reports of an inter-disciplinary or inter-agency significance; brief reports of expert conferences and seminars. They should continue (as at present) to encourage the initiative of research workers and institutes and to promote health education in developing countries. In addition, it would be desirable to develop a system of direct material support, especially in the direction of continuity of effort and prompt publication of research findings.

4.4 Directions for Future Research

Until a large quantity of the already existent material has been collated and assessed, it is hardly possible to state which specific researches are now required. Part of the task of collation will consist in identifying where there are lacunae and in stating priorities for future effort. However, one or two general directions can be mentioned. First, there does seem to be a need for some large-scale longitudinal study, in order to establish norms of child development, both physical and mental. For example, it is hard to say whether bilharzia has an effect on performance, since in an area where bilharzia exists, everybody has it, and so no one knows what would be a standard performance for people without it.

At the same time, it must be acknowledged that longitudinal studies are expensive and time-consuming, perhaps disproportionately so in comparison with the utility of various types of small-scale investigation. The ongoing work of Dr. Dan's Dakar team is a good example of what can be achieved with relatively small resources. The information obtained may be of local significance initially, but its diffusion quickly shows it to be of wider interest, and new data are forthcoming at fairly frequent intervals.

Such work can be supplemented without much difficulty (provided technical guidance is available) by the ongoing local enquiries of teacher-training establishments, individual researchers in universities, etc. To say that central direction is necessary would be putting it too strongly, but central co-ordination of results

is desirable, and certainly a centralised record of what is being done, and why. In some cases duplication should be avoided, but in others duplication in the sense of replication may be desirable, so as to discover regional differences in certain phenomena through controlled parallel studies.

Some of the data surprisingly lacking at present are relatively simple data, which could be obtained fairly easily by people with only a brief training. Data on school performance are available, but exact data on (for example) body-size of children of various age, incidence of malaria, blood count, are not. Some of the measures could probably be obtained by teachers, others (on a sample basis) by dispensers, nurses, etc. Technical guidance on sampling and technical control of such items as blood-test could be ensured by professionals but much of the routine could well be carried out by briefly-trained people.

Finally, even in advanced countries and certainly in the developing countries themselves, there is scope for co-operation between universities and institutes, and of course for collaboration between different disciplines in any given university. Some advanced students working for a master's or doctor's degree might welcome an opportunity to pool energies and information in inter-disciplinary and inter-university working-parties. Such an effort would cost very little in financial terms, and would be of benefit to the education of its participants as well as to the broader cause of which it was a part. Perhaps the very last statement of this report should reiterate what was the constantly recurring theme of the Conference: it is not research that is lacking, but communication. In an age when multidisciplinary studies are becoming more widely accepted, the young generation may possibly be less firmly embedded in specialised ruts than their predecessors, and therefore more willing and able to communicate across the largely artificial barriers that separate nutritionists, pediatricians, educators and sociologists.

PART II

SELECTED EXTRACTS FROM CONTRIBUTIONS

5. EDITOR'S NOTE

About a dozen major papers and several briefer notes were submitted to the Conference by participants and by other experts whose opinions were sought. Only a few of the papers are reproduced here, since considerations of space precluded reproduction of all the contributions, and some note is called for, regarding the basis on which selection has been made. Some of the papers were submitted in the form of working documents which would have needed revision before publication; some of the papers were somewhat generalised; and some of the country studies presented considerable areas of overlap with one another.

The paper of Dr. Canosa is an interesting example of what is meant by the term 'longitudinal study'; it shows the scale on which such a study has to be undertaken to be worthwhile, and it shows the kind of data likely to emerge.

The paper of Dr. Raoult is generalised in its findings, but it is based on a number of empirical studies.

The paper of Dr. Dan and his colleagues includes references to the small-scale enquiries carried out at Dakar over a period, and gives an indication of the kind of useful data which may be obtained by a marginal research activity conducted by nutritionists or pediatricians alongside their normal work.

The paper by Mr. Chang is a country study giving a reasonably typical description of the impact of malnutrition and disease in one region.

A complete list of the papers submitted to the meeting is to be found on page

All the main sources referred to in the papers reproduced and most of the main sources referred to in papers not reproduced have been consolidated into the Bibliography which concludes this report. This is divided into four broad categories: I. Nutrition; II. Diseases; III. Educational and Social Factors; IV. Demographic, Economic and Other Factors. Within each category, items are listed alphabetically by author as far as possible.

6. NUTRITION, PHYSICAL GROWTH AND MENTAL DEVELOPMENT

C. A. CANOSA

6.1 Introduction

Protein calorie malnutrition (PCM) today is under serious consideration as a determining factor in mental development. The problem is of present importance and urgency because of the number of infants and young children in developing countries suffering from some degree of PCM. The severe nutritional illnesses of kwashiorkor and marasmus are within this group, but they represent less than 3% of underfed children in developing countries. The mild to moderately chronic forms of PCM affect 60% to 70% of all preschool children in those countries, and they number approximately 400 million (Behar, 1967, I.). This situation coincides with a time in human history when individual skills, physical fitness and good mental capacity are increasingly necessary to implement technological advances in the developing countries, in order to compete with those achieved in well developed

countries. Therefore, if the situation goes unchecked, the already existing gap in training and skills between developed and under-developed countries will continue to widen. What would the resulting situation be? Underfed, undertrained, and under-educated people in the world will further increase in number, rendering any contacts with the remaining favoured societies even more difficult. In other words, we may be witnessing a situation in which approximately two-thirds of the preschool children in the world are becoming mentally handicapped due to PCM.

A shrinking availability of food per capita, brought about by the rapidly growing population, is one of the factors responsible for the condition described. This compounds the problem. Even with the strongest determination to face the existing situation, establishing whether children already born are handicapped in a reversible or an irreversible fashion is an extremely difficult task. In its totality, the problem is formidable, for the implications of and approaches to each situation are different every time.

6.2 History and Background

6.2.1 Experimental studies on animals

An impressive volume of evidence shows that in experimental animals, diet modifies physical growth and maturation. Some of the landmarks are as follows:

Working with rats, Kennedy (1957, I.) showed that under-nutrition at an early age produces smaller adult animals than similar counterparts fed an adequate diet. Stewart and Plat (1958, I.), studying pigs receiving a protein-restricted diet, demonstrated retarded bone growth in comparison with animals subsisting on an adequate diet. Depending on age at onset, some changes were reversed by subsequent protein supplementation.

Biochemical maturation also may be affected in severe malnutrition. Ross and Batt (1957, I.) found the relation between enzymatic activity, chronological age and dietary intake in rats so well defined that it was possible to predict levels of various hepatic enzymes from the dietary history and age of the rats.

More specifically, in relation to the central nervous system (CNS), Dobbing (1964, I.) found that prolonged PCM in rats and pigs produced a reduction of cholesterol and phospholipids in about the same degree as for brain weight. However, lipids specifically enriched in myelin (cerebrosids, proteolipids and plasmologens) are reduced to an even greater degree than brain weight. This suggests that severe malnutrition affects the process of myelination of the CNS during early stages of development to make it more vulnerable to injury. Benton and colleagues (1966, I.) demonstrated that the decreased myelin components correlated with a decrease of myelin by histological techniques. Chase and colleagues (1967, I.) showed that severe nutritional deprivation in young rats was associated with a decrease in synthesis of sulphatide. This defect was not corrected by re-feeding. The authors concluded that the time of active myelin formation was a nutritionally vulnerable period in the development of the CNS.

In relation to behavioural changes produced by malnutrition, Barnes (1966, I.), working with rats, demonstrated that severe PCM in early life resulted in long-lasting behavioural changes, including what he interpreted as retarded ability to solve complex problems. More recently, Barnes (1967, I.) showed that while moderate nutritional deprivation in early life may result in permanent alterations in certain behavioural changes, complex problem-solving appeared only to be affected in cases of severe PCM.

6.2.2 Work with animals

Many studies have also been conducted on the effects of PCM on the mental development of children. Mainly using the Gesell scales, Gomez and co-workers (1954, 1.), in Mexico in 1954, suggested that different forms of PCM were accompanied by altered behaviour and personality. Also using the Gesell techniques in Africa, Geber and Dean (1956, 1.) reported similar findings. In Mexico, Robles and co-workers (1959, 1.) demonstrated long-lasting behavioural changes in patients suffering severe kwashiorkor and marasmus. Also using the same Gesell methods, Barrera Moncada (1963, 1.) in Venezuela followed children with kwashiorkor and marasmus for several years after their recovery. Seven years later, performance in all tested areas was poorer than among comparable children of the same genetic origin who had not suffered malnutrition.

Cabak (1965, 1.) in Yugoslavia found permanent decrements in mental performance of children after several years following clinical recovery from severe PCM (marasmus). Stoch and Smythe (1967, 1.) in South Africa, following groups of children belonging to two contrasting social classes with different nutritional status during a seven-year period, found marked differences using the Gesell, Merrill-Palmer, and a modification of the Simon-Binet intelligence scales as a measure of their mental performance. Finally, Cravioto and co-workers (1967, 1.) reported retardation in the development of intersensory integration among malnourished children in Mexico and Guatemala.

On the basis of all these findings, it is logical to conclude that in developing countries, malnutrition could be a common factor responsible for retardation of physical development and poor mental performance.

6.3. Concepts and Definitions

Definition of malnutrition. - What is the meaning of the terms malnutrition, undernutrition, protein-calorie malnutrition? Do these terms express the same concept?

Whatever the term, malnutrition in its many forms is a phenomenon determined by multiple factors, closely related to numerous economic and social conditions. When viewed from this complex perspective, the problem of the investigator becomes not that of absolutely isolating the effects of malnutrition per se, but of demonstrating the effects of malnutrition as it interacts with the other variables of the 'poverty syndrome' (Klein, 1967, 1.)

In most of the preceding field studies, designed to explain the effects of malnutrition on mental development, the main emphasis was on food availability and food intake. With few exceptions, however, the great majority of the populations concerned suffer from cultural and educational deprivation, 'social malnutrition', in addition to economic deprivation, and these factors relate intimately to PCM. The problem of separating the effects of cultural and educational deprivation from the possible effects of PCM on mental development of an individual is rather complicated, as all these elements affect mental performance. Therefore, any thorough investigation intended to demonstrate the importance of nutrition for mental development must take into full consideration all possible factors recognized as bearing on mental development. Otherwise the results cannot be properly interpreted.

6.4 Developmental Periods of the Central Nervous System (CNS)

In general, the development of the CNS undergoes three different periods:

1) neutral development, which is accomplished very early in mammals and man
2) development of the oligodendrocytes, occurring soon afterwards
3) myelin lipid formation, which is manufactured by the oligodendrocytes.

Theoretically, it is important to consider that the effects of malnutrition in man may vary depending on the development period in which it occurs.

The time peak of appearance of the developmental stages of the CNS differs according to the species and in relation to their birth. For example, myelin lipid formation in guinea pigs occurs at 20 days before birth; in rats, at 11 days after birth and in man during the last 6 to 8 months of pregnancy (Dobbing, 1967, I.). This myelination period in man is followed by very fast brain growth rate during the first months of extra-uterine life. Finally, the brain does not grow at a standard rate in its early development; on the contrary, there are 'brain spurts'. If periods of maximum brain growth coincide with periods of malnutrition, there is an increased possibility that brain development may be irreversibly affected. However, if malnutrition, even in a severe and long-lasting case, were to occur at a time when brain development was completed, there may be no changes produced in brain composition or function (Brozek, 1961, I.).

Intra-uterine factors. - Central nervous system development in man occurs most rapidly during the last 6 to 8 months of pregnancy and the first two months of extra-uterine life. Factors which retard intra-uterine growth may also alter CNS development. The causes responsible for intra-uterine growth retardation are: a) fetal malnutrition due to maternal malnutrition or, more frequently, to placental insufficiency; and b) fetal malformations.

In developed countries, numerous cases of severe fetal malnutrition occurred only during serious world crises such as famine or war. There ist still not sufficient evidence to prove that children born during these periods were mentally handicapped due to alterations in CNS development. In the case of inborn errors of metabolism or other types of fetal pathology not directly due to malnutrition, there is evidence that they could be responsible for these alterations. Thus, the alterations in performance observed in children of the developed countries are mainly due to fetal malformations and placental insufficiency, and not to fetal malnutrition resulting from maternal malnutrition (Drillien, 1968, I.).

It is a common assumption that in impaired mental function due to malnutrition, the earlier the onset, the longer the duration and the greater the severity, the greater the damage to the brain. However, what is early? Must we consider the uterine environment? Are we becoming more appreciative that mental handicaps occur in children in the course of intra-uterine growth without subsequent physical growth impairment? What happens if the mother is malnourished before she becomes pregnant, with that state continuing through gestation?

Recent placental studies still under way in rural areas of Guatemala where malnutrition is prevalent illustrate the point of intra-uterine factors and the possible effects of malnutrition on fetal development.

The information previously mentioned points to the fact that the crucial period for PCM to have a direct effect on brain function could be during the last three

months of pregnancy and the first six months of extra-uterine life. It is likely that after these critical developmental periods, socio-cultural factors are mainly responsible for the poor mental performance observed among children in developing countries. Late preschool and school ages are of lesser importance. Thus, our efforts to demonstrate brain function impairment directly due to malnutrition are focussed on psycho-physiological responses obtained during the first twelve months of life. Mental performance after this period becomes socially conditioned.

The staff of the Growth and Development Unit at the Institute of Nutrition of Central America and Panama (INCAP) has been engaged during the past three years in a long-term perspective field programme studying the effects of malnutrition on physical growth and mental development.

6.5 Identification of Variables

What are the main variables in the problem? Is quantification possible? Is it worthwhile to begin so complex a study before identifying the possible principal causative factors?

A major difficulty arose in developing methods of measurement serviceable under field conditions. Methods of proven reliability under modern clinical and laboratory conditions are not always transferable to the field. In some instances, no tried procedure existed. The futility of collecting information with lack of quantitative value led to a decision to accomplish that aim even if we never moved into the definitive investigation. The objective has been attained. We have identified the three main variables:

State of nutrition (independent variable). - The state of nutrition of a population is commonly defined by factors of food production, distribution, availability, consumption and utilization of nutrients. For the individual, clinical history, clinico-nutritional examination, physical anthropometry, incidence of disease and injury, dietary studies, bone development and maturation, and biochemical tests are proved and useful procedures. Unfortunately, no generally accepted model exists by which the nutritional state of the individual or of populations can be determined with quantitative exactness.

For the definition, classification and quantification of the independent variable, the following methodology is being used:

1) Clinico-nutritional examination: based on INCAP/ICNND (1963/1966, I.) and WHO (1963, I.; Jelliffe, 1966, I.) data

2) Neurology: methods of R.S. Paine (1960, I.), André -Thomas (1964, I.) and Gesell (1965, I.)

3) Anthropometry: methodology used by the International Children's Centre (Falkner, 1966, I.) and Iowa studies (Jackson, 1945, I.)

4) Morbidity: collected on house-to-house calls every 15 days

5) Dietary surveys: INCAP's methodology using one- or seven-days surveys (Flores, 1962, I.; ICNND, 1963, I.)

6) X-rays: using the study methods of Greulich and Pyle (1959, I.), Tanner (1962, III.), cortical thickness of Fels Research Institute (Garn, 1958, I.) and number of ossification centres (Nelson, 1959, I.)

7) Biochemistry: haemoglobin, haematocrit, total serum, protein and electrophoretic fractionation, albumin, globulin, A/G serum, vitamin A and carotene, urinary excretion of creatinine, urea, urea/creatinine (Barker, 1944, II.; Bessey, 1946, I.; Clark, 1949, I.; Gradwohl, 1935, I.; Hainline, 1958, I.; ICNND, 1963, I.; Microzone Electrophoresis Cell, 1963, I.; Nelson, 1959, I.).

Environment (intermediate variable). - The social impacts on mental development are many. Regardless of which socio-cultural variables are to have an eventual primary emphasis, it is mandatory to collect and study a wide range. Adequate characterization requires a detailed knowledge of the population under study with respect to family composition, child-rearing practices, social status, migration, patterns of communication, socialization process, economic factors, family and community expectations, food habits, customs, beliefs, secular and introduced changes and perhaps others yet to be defined. An attempt has to be made to establish numerical relationships between selected ones and the nutritional state and mental development of populations and persons. That quantification is possible for all, or even the majority, is doubtful. Nevertheless, the effort is made, although with practical conviction that numerous elements will have to be interpreted descriptively rather than in mathematical fashion.

Mental development (dependent variable). - The tests developed to measure psychological development may be divided into two categories: a) development or infant scales, for use with infants from birth through two years of age; b) a battery of tests for use with preschool children from three to seven years of age.

The infant scale is composed of items borrowed from the Bayley, Gesell, Cattell and Merrill-Palmer scales, and is used to measure development of children at three points during the first two years of life: 6, 15 and 24 months of age.

The choice of tests and test materials for the preschool battery, which is used from three to seven years, was guided by four primary considerations:

a) the tests should be appropriate for the culture in which they are to be administered
b) the tests should require a simple and, when possible, non-verbal response
c) the tests should tap what are generally considered fundamental cognitive processes.

The battery of preschool tests explores four areas of intellectual development: perception, learning, memory and language. In addition, several other tests are employed to investigate behavioural characteristics such as attention, motivation, persistence, resistance to distraction and ability to inhibit impulsive motor responses.

6.6 Research Design

The main feature of the experimental design is an ecological approach by which two similar groups of children in rural Guatemala, one with an improved diet and the other with the conventional diet of the region, will be compared. The two child populations include all individuals aged less than seven years, along with newborn infants entering the group during observations lasting at least seven years. Ideally, the only difference between the two groups would be in nutritional status, a result impossible to achieve with human beings living in an open community.

The ideal experiment would cover the whole adaptive from conception to adulthood. The most serious, and perhaps irreversible, physical and probably mental damage by malnutrition takes place during pregnancy and the first years of life. On the other hand, mental development is by no means so restricted, nor is early

childhood necessarily the most critical time. Much of the learning process starts with the two-year-old (Bayley, 1966, 1.). Language learning occurs between two and twelve years of age. Memory is not fully developed until fourteen years. The complex process of a growing intelligence begins at four or five years and lasts until adult age. By current concepts, the critical age to study the effects of malnutrition is from six months until five years; the critical period to demonstrate its possible effects on mental development is from four years onward. Consequently, any study intended to demonstrate the significance of malnutrition as a factor in mental development must extend over sufficient time to permit proper definition and quantitative evaluation of both. A study limited to seven years faces the real possibility that the effects of PCM on mental development would not be fully determined. Such a study should give, however, strong indication of the reasonableness of continuing observation. For many reasons, operational, administrative, technical and professional, the study is, at this point, limited to seven years. Providing results so warrant, the present research design has plans for an extension to age fourteen years.

The programme focuses on the whole of physical and mental development, beginning with nutritional studies of the family unit and following pregnant women from conception through pregnancy and delivery. Newborns are observed from delivery to seven years of age, with periodic evaluation of nutritional status and mental development. The study is an interdisciplinary effort, specially involving integration of biological and socio-cultural variables. The programmed activities are presented on Table 1.

The final design includes three sets of communities, strictly matched for biological, psychological and socio-cultural variables. Population No.1, defined as experimental, has nutritional supplementation and medical attention. In Population No.2 the first control, medical attention is provided but no nutritional supplementation. Population No.3 is called a blind control, it has neither element. In order to furnish the first control community with the same or equivalent social stimulation as provided in the test population by the nutritional supplementation, a 'fresco' (soft drink) without nutritional value is supplied.

Once a set of communities is found, the main variables introduced are: nutritional supplementation, medical care and social stimulation, the latter due mainly to the presence of the team in the village and to the interaction due to the nutritional supplementation provided in the experimental community. Thus, the final design is presented on Table 2. This type of design allows for isolation of the effects of nutrition and those of social stimulation on mental development.

Three sets of villages are under investigation. Each set per se is sufficient to provide the information required. The main reason to choose nine 'aldeas' was to divide the risk of some unpredictable catastrophic event, such as earthquake, volcanic eruption, drought, local political crisis, government intervention, intrusion of a new industry or the like, any of which could ruin a long term prospective study. For concurrent replication of the experiment, for insurance if for no other reason, it is necessary to include the nine minimally required villages.

The criteria applied to match all villages include two groups of variables: quantifiable and non-quantifiable. The most important 'quantifiable' variables are those which relate to physical growth, mental development and socio-cultural status. With respect to physical growth matching among preschool children, four anthropometric measures are applied: weight, height, arm circumference and tricipital skinfold thickness. For mental development matching, six measures covering the areas

of attention, learning, memory and language are applied. The social quantifiable variables explored for matching are: size of population, size of sample, composition of the population, dependency rate, birth rate, mortality rate, financial status, land holding and use, housing, education, isolation and migration.

The non-quantifiable socio-cultural variables explored for community matching are: family composition, patterns of disease and injury, patterns of nourishment, expectations and social facilities.

6.7 Results to Date

On the basis of the data collected during the exploratory phase of the study, some preliminary results are presented. These results illustrate the health conditions and mental performance of individuals living in the areas where the study is being carried out.

Diet of pregnant women. - Table 3 summarizes the results of a dietary survey conducted in 58 pregnant women in two rural villages. A monthly dietary survey is obtained as soon as a pregnant woman is identified and is continued until the time of delivery. Marked deficiencies can be noted during the three trimesters for practically all nutrients studied, being more severe during the first trimester. These deficiencies are more severe for calories, protein, vitamin A and riboflavin. Furthermore, the deficiency of protein is even more serious than indicated by total protein consumption, because only 20% of the total protein comes from animal sources.

Biochemical analysis of placentas. - Table 4 shows the results obtained in 20 placentas belonging to rural women of two of the communities under study. The chemical composition of these placentas was found different for similarly processed placentas of women in the state of Iowa, U.S.A., examined (Canosa, 1968, I.).

The average DNA concentration per kilo of placenta was 1.8 grams for the Guatemalan sample versus 3.42 grams for the North American sample. If it is assumed that the DNA concentration per cell is a constant factor, the total number of cells per placenta can be calculated. Accordingly, the total numbers of cells in placentas from the U,S.A. was calculated to be 2.517×10^{10} (Brozek, 1961, I.). In view of the severe dietary deficiencies occurring during pregnancy, it is reasonable to postulate that placental alterations could be partly due to these nutritional deficiencies. Furthermore, the anatomical changes could be responsible for functional alterations which, in turn, could damage the fetus. Further research is being carried out in this area.

Mortality in preschool children. - Table 5 illustrates the patterns of death among children up to seven years of age in the villages under study. The death rates are higher during the neo-natal period, and particularly high for the post neo-natal period and second year of life. The death rate in each community was taken into consideration to determine the sample size necessary to obtain a representative number of children at the end of the study. Based on this information and on the birth rates of the same communities, the size of the villages to be chosen for the study was also calculated.

Diet of preschool children. - A recent and complete dietary survey of one of the communities is presented on Table 6. It can be seen that there is a marked deficiency for the majority of nutrients investigated. The deficiencies are more severe during the first two years of life. The nutrients showing the more severe deficits are similar

to those noted among pregnant women; that is, calories, protein, vitamin A, riboflavin, niacin and vitamin C.

Physical growth. - Graphs 1 and 5 present comparative values for height and weight between Guatemalan and U.S.A. preschool children. The Guatemalan sample included 2,800 children (representing over 92% of this population group) from eight rural communities. The standards of comparison for both measurements are the growth curves of Iowa (Jackson, 1945, 1.).

The growth velocity in height is presented in Graph 2. It can be seen that during the first three months of life, the velocity is the same for both an urban healthy sample and a rural sample. After three months, however, there is a marked deceleration of growth velocity in rural children, lasting until about 30 months. Beyond 30 months they begin to recover, and by 60 months their velocity rate for height is practically the same as that of urban children.

Bone development. - Graph 3 shows critical thickness as measured in the second metacarpal, in comparison with norms of the Fels Research Institute for a North American population; significant differences between the two samples are clear.

Graph 4 shows bone development studied by the Greulich and Pyle method, in a Guatemalan sample of 80 preschool children, representing practically 100% of the universe of one village.

Mental performance in malnutrition. - A pilot study was conducted among 20 children who had been clinically diagnosed as malnourished at some point in early childhood, but who had been nutritionally rehabilitated at the time of testing. Height was also taken into consideration for the classification of malnutrition. The heights of the children in this sample were 14% or more below normal for their ages. The results obtained were compared with those of ten of their siblings, who had no clinical history of malnutrition, and whose height-for-age ratio showed a deficit between 0 and 10%. The results are expressed on Tables 7 and 8.

The control group performed significantly better than the experimental group in four of the ten measures used. Two of the tests which yielded significant group differences are adaptations of standard short-term memory tasks, Memory for Digits and Memory for Sentences. The other two tests which revealed significant group differences are Intentional and Incidental Learning. We are currently exploring three possible interpretations of these data:

a) that children who have been malnourished are less competent in the area of short-term memory

b) that the group differences are due to an inability on the part of the previously malnourished children to respond verbally (i.e. to decode experience linguistically)

c) that the previously malnourished subjects are unable to pay close attention during testing.

6.8 Summary

Some illustrative points are presented showing that in the populations under study, there are marked nutritional deficiencies starting with pregnant women and early childhood. These deficiencies are reflected in placental alterations, poor and distorted physical growth and high mortality rates.

Children recovered from severe PCM performed less well in psychological tests than their siblings, pointing to the possibility that severe malnutrition within the same social environment can produce changes in mental development.

Long-term perspective studies are necessary to obtain data with which to demonstrate and quantify the relative importance of the effects of socio-cultural and nutritional factors on mental development in developing countries.

TABLE 1

Program Activities of the Growth and Development Unit

	Pregnancy									N.B.	1 year						2 years				3 years				4 yrs	5 yrs	6 yrs	7 yrs		
Months	-1	-2	-3	-4	-5	-6	-7	-8	-9	0	2	4	6	8	10	12	15	18	21	24	27	30	33	36	42	48	54	60	66	72	78	84
Pre-natal nurse	x	x	x	x	x x	x	x	x	x x x x	x																				
Pre-natal medical care				x				x		x																				
Placental study										x																				
Anthropometry Neurology										x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Clinico-nutritional										x			x			x		x		x		x		x	x	x	x	x	x	x
X-Rays													x			x		x		x		x		x	x	x	x	x	x	x
Biochemistry +			x					x		x			x					x		x		x		x	x	x	x	x	x	x
Dietary survey pregnancy	x	x	x	x	x	x	x	x	x																					
Dietary survey preschool child																x	x	x	x	x	x	x		x		x	x	x	x	x	x
Milk production ++											xx	xx	xx	xx	xx	xx	xx														
Psychology													x				x			x				x		x		x		x	

+ Urine samples would be obtained whenever possible from each child, pregnant woman and lactating mother during each visit.

++ The quantity of breast milk produced is studied in cohorts of 5 mothers.

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TABLE 2

Experimental Design

	Experimental group	Control group 1	Control group 2
Medical care	X	X	O
Nutritional supplementation	X	O	O
Social stimulation - "fresco"	O	X	O

X = was provided

O = was not provided

TABLE 3

Dietary Intake among Pregnant and Lactating Women

Los Planes 1968

Trimester	N	Calories		Total Protein (gm)		Animal Protein (gm)	Calcium (mg)		Niacin (mg)		Riboflavine (mg)		Iron (mg)		Thiamine (mg)		Vitamin A (mg)		Vitamin C (mg)	
		Total	%	Total	%	Total	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%
1	20	1418	71*	39.2	65*	8.0	768	171*	7.0	53*	0.68	57*	16.9	181*	0.81	101*	0.07	36*	36.5	81*
2	57	1733	78*	49.7	71*	7.4	967	88*	9.7	67*	0.71	55*	16.9	121*	0.99	110*	0.53	33*	28.8	44*
3	57	1819	83*	53.9	77*	8.7	1012	92*	10.3	71*	0.79	61*	20.3	145*	1.07	119*	0.75	47*	39.4	61*
Lactating	36	1599	57*	58.0	68*	9.9	887	81*	9.9	54*	0.58	36*	21.3	152*	1.03	94*	0.34	16*	12.9	14*

* INCAP Daily Nutritional Recommendations for Population of Central America and Panama. Revised June, 1965

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TABLE 4

Placental Composition

U.S.A. (20) vs. Guatemala (20)

	M	SD	t	Significance
Weight (gm)				
U.S.A.	414.3	113.0		
Guatemala	435.5	136.3	-0.464	$.6 < p < .7$
DNA (gm)$^{++}$				
U.S.A	3.989	0.785		
Guatemala	1.850	0.654	5.584	$p < .002$
No. of cells ($\times 10^{10}$),$^{++}$				
U.S.A.	2.517	0.628		
Guatemala	1.697	0.384	4.670	$p < .002$
Concentration per Cell (uug.)$^{+}$				
N/cell ($\times 10^{-1}$)				
U.S.A.	3.710	0.878		
Guatemala	4.313	1.177	-1.578	$.1 < p < .2$
Fe/cell ($\times 10^{-3}$)				
U.S.A.	2.346	0.766		
Guatemala	1.991	1.109	1.008	$.3 < p < .4$
Cu/cell ($\times 10^{-5}$)				
U.S.A.	5.375	2.534		
Guatemala	5.752	2.413	-0.430	$.6 < p < .7$
Zn/cell ($\times 10^{-4}$),$^{++}$				
U.S.A.	1.134	0.359		
Guatemala	2.138	0.692	-3.922	$p < .002$
Mn/cell ($\times 10^{-6}$)				
U.S.A.	4.722	1.638		
Guatemala	3.872	2.374	0.967	$.3 < p < .4$
Cr/cell ($\times 10^{-6}$),$^{++}$				
U.S.A.	6.015	3.013		
Guatemala	3.036	1.879	3.506	$p < .002$

$^{+}$ Assuming constant DNA per cell

$^{++}$ Significantly different

M = Mean
SD = Standard Deviation
t = t-distribution of probability
p = probability of statistical error

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TABLE 5

Death Rates among Preschool Children in a Guatemalan Village

Age Groups	Death Rate per 1.000 Children	
	Acatenango 1960-1965	Rural Guatemala[+] 1959-1964
Peri-natal	59	30[++]
Neo-natal	65	64.4
Post-neonatal	48	83.4
Second year	45	51.7
Third year	24	32.8
Fourth year	13	20.1
Fifth year	10	12.5
Sixth year	3	-

[+] INCAP-OIR

[++] Death 0-6 days

TABLE 6

Average Intake Levels of Nutrients in Preschoolers

Los Planes 1968

Age (yrs)	N	Calories		Protein (gm)		Calcium (mg)		Iron (mg)		Vit. A (mg)		Thiamine (mg)		Riboflav. (mg)		Niacin (mg)		Vit. C (mg)	
		Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%
1	8	579	45	15.9	49	392	49	5.4	68	0.281	47	0.37	74	0.53	66	2.71	30	17	42
2	9	807	62	21.2	66	423	53	7.2	90	0.222	37	0.42	84	0.27	34	4.74	53	14	35
3	10	1139	71	30.6	76	527	66	12.5	125	0.317	42	0.61	102	0.36	36	5.66	51	16	32
4	15	1219	76	32.7	82	673	84	13.7	137	0.380	51	0.76	127	0.43	43	6 51	59	21	42
5	2	1498	94	37.3	93	850	106	18.0	180	0.313	42	0.92	153	0.44	44	8.28	57	24	48

National Research Council Recommended Allowances, 6th revised edition, 1964
A report of the Food and Nutrition Board, NAS/NRC, Publication 1146

TABLE 7

Descriptive Data - Experimental and Control Groups

Groups	Age/Months	Height/cm	% Deficit Height/age
Control group N = 10	$\bar{x}$ = 67.60 SD = 8.15 R = 55-77	$\bar{x}$ = 106.85 SD = 5.40 R = 95-115	$\bar{x}$ = 7.10 SD = 2.38 R = 5-10
Experimental group N = 20	$\bar{x}$ = 64.40 SD = 7.20 R = 54-78	$\bar{x}$ = 95.56 SD = 4.34 R = 88.9-102	$\bar{x}$ = 15.50 SD = 3.83 R = 13-28

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$\bar{x}$ = Mean
SD = Standard Deviation
R = Range

TABLE 8

Means, Standard Deviations and Ranges for Experimental and Control Groups and Tests of Significance of Group Differences

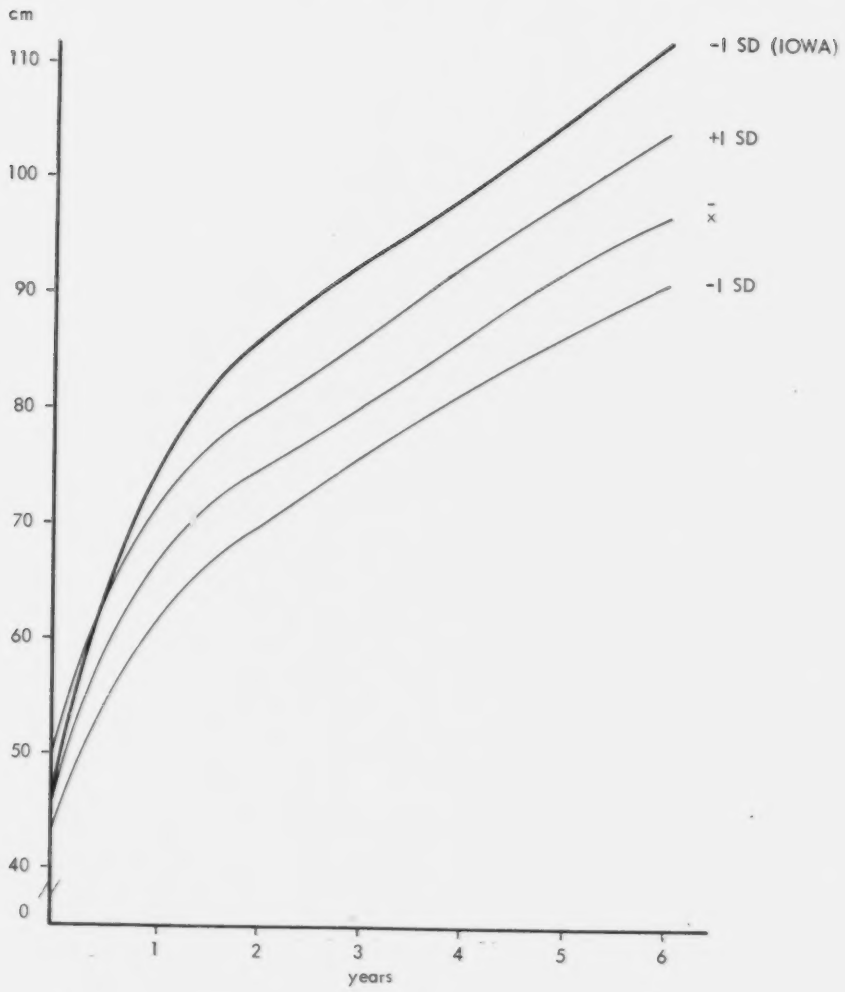
Tests	Control	Experimental	Values of U, t and Significance Levels
Memory for digits	$\bar{x}$ = 47.50 SD = 6.86 R = 42-60	$\bar{x}$ = 32.75 SD = 12.92 R = 15-63	t = 3.36 (df=28) $p < .01$
Memory for sentences	$\bar{x}$ = 65.20 SD = 12.53 R = 50-94	$\bar{x}$ = 48.55 SD = 22.34 R = 5.78	t = 2.18 (df=28) $p < .05$
Incidental learning	$\bar{x}$ = 1.70 SD = .95 R = 0-3	$\bar{x}$ = 0.80 SD = 1 R = 0-3	U = 48 (n_1=10, n_2=20) $p < .05$
Intentional learning	$\bar{x}$ = 3.10 SD = 1.30 R = 1-5	$\bar{x}$ = 1.90 SD = 1.50 R = 0-4	U = 54 (n_1=10, n_2=20) $p < .05$

$\bar{x}$ = Mean
SD = Standard Deviation
R = Range

t = t-distribution of probability
U = U-distribution
p = probability of error

GRAPH I

Height of Pre-school Boys in Eight Guatemalan Villages 1965



x̄ = Mean

SD = Standard Deviation

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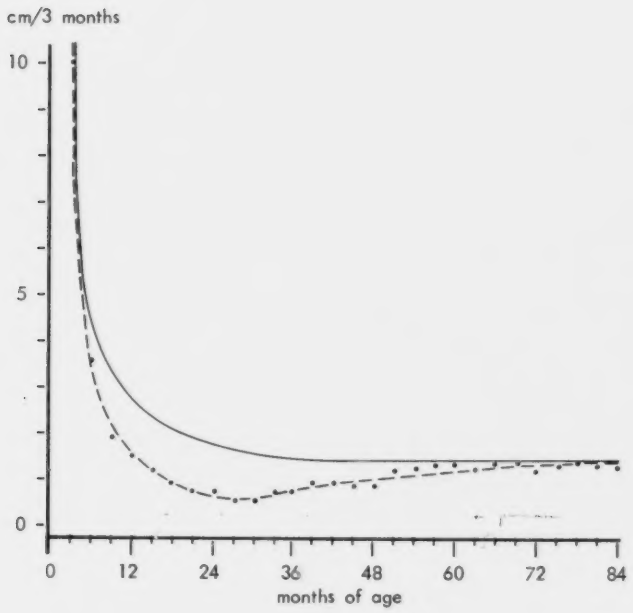
GRAPH II

Quarterly Increments of Growth in Height of Rural Children

Guatemala 1968

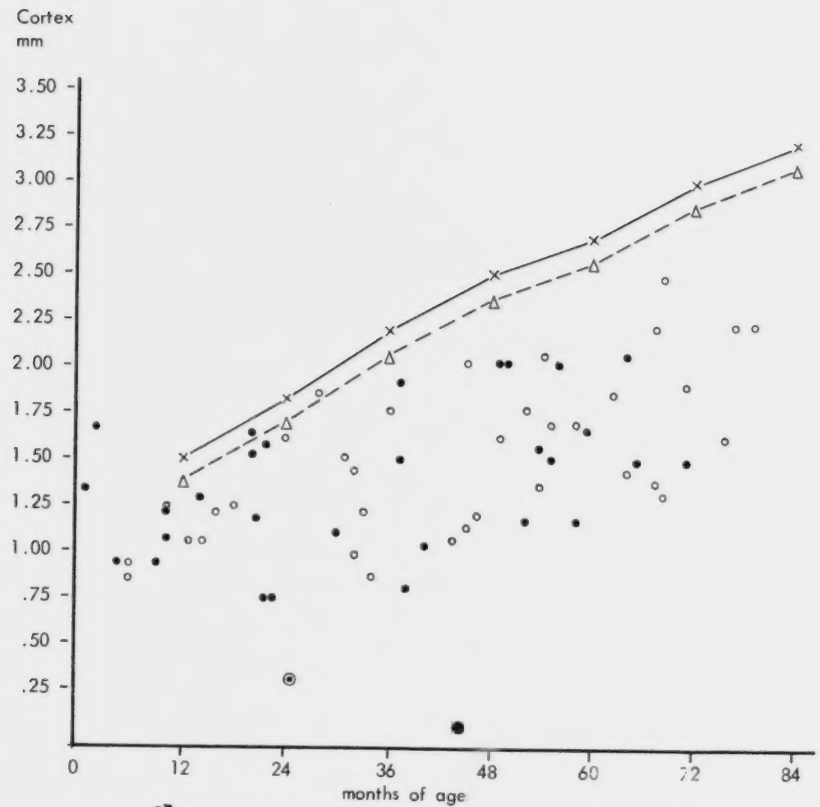


INCAP 68-5

GRAPH III

Cortical Thickness 2nd Metcarpian in Rural Children

Guatemala 1966

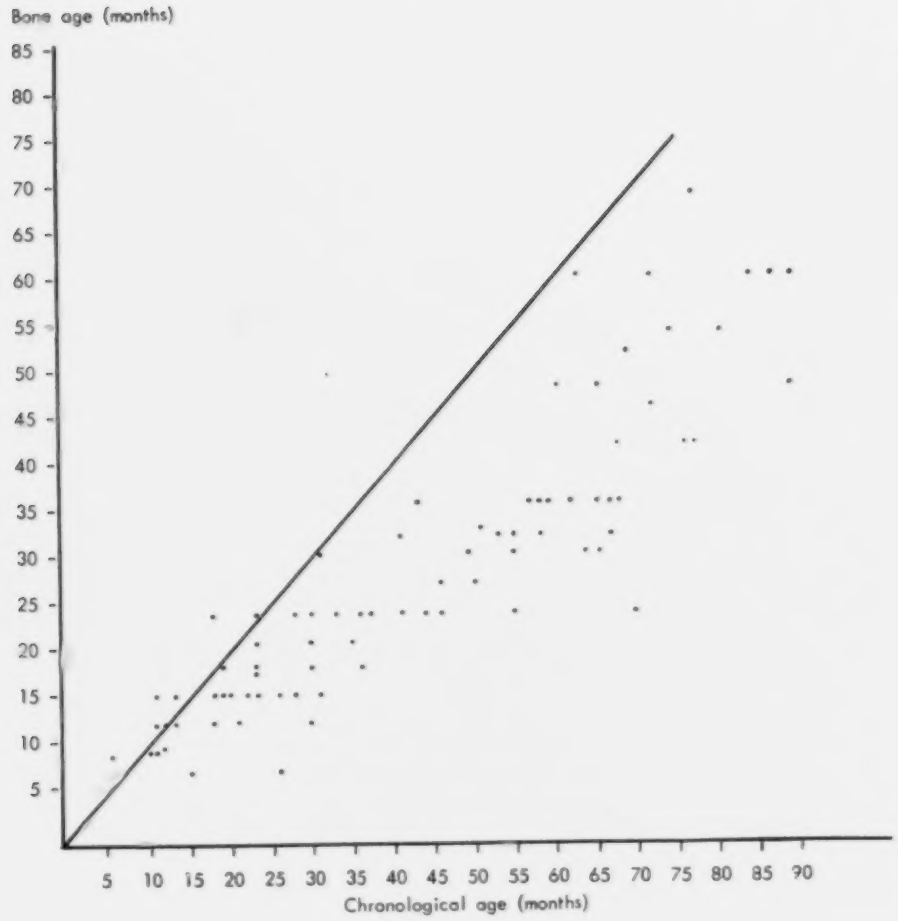


GRAPH IV

Bone Development

80 Preschool Children - Aldea Los Planes

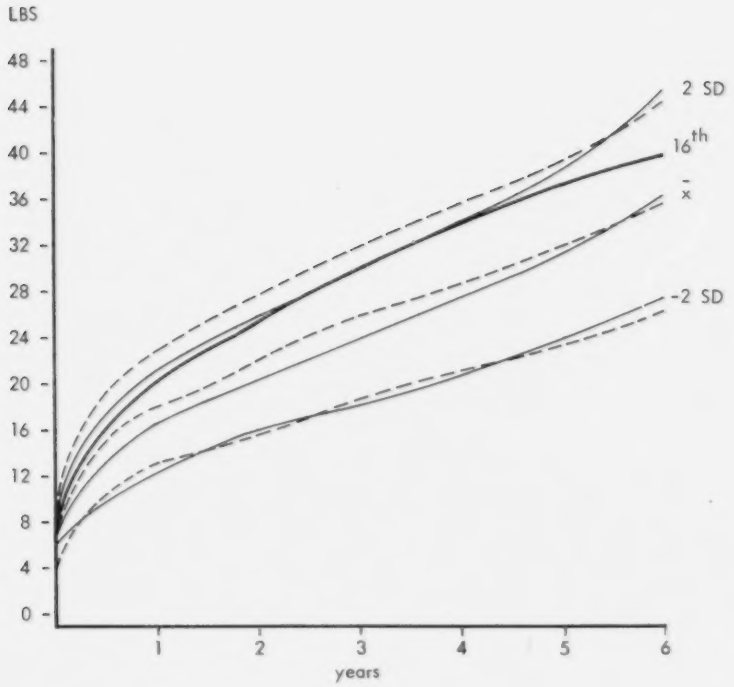
July, 1967



Greulich & Pyle

GRAPH V

Weights of Preschool Boys and Girls
in 8 Guatemalan Villages 1965



--- Boys
— Girls

$\bar{x}$ = Average weight
SD = Standard Deviation
16^{th} = 16^{th} Percentile

INCAP 65-572

7. THE NUTRITIONAL CONDITION OF SCHOOL CHILDREN

A. RAOULT

7.1 Introduction

Nutrition is uninterrupted from the conception and throughout the birth and growth of the child, the adolescent and the adult. Each stage conditions the next one.

The school-age child may inherit somatic retardation, irreversible lesions, enzyme and functional disturbance, appearing and often accumulating after the nutritional crisis in early childhood.

Kept within his family, in the same environment, the child is still exposed to its economic, nutritional, social and cultural conditions; his only escape, and then only for a few hours - when he has reached school age - is the school. Otherwise he remains in his accustomed environment.

An important government move has been made in the Maghreb towards supplementing the family diet by school meals, and there is every justification for this; but a similar, and no doubt more rewarding effort has still to be made for the preschool child. From the psychological point of view, this is a new step towards self-sufficiency by a partial separation from the family unit.

The nutritional condition of the school-age child is the combined result of a number of factors:

1) inheritance from earlier stages
2) present dietary factors
3) sanitary conditions
4) parasitic infections or infestations
5) effectiveness of the health and social services.

They interact and overlap, and as in all the previous stages (but perhaps not so obviously) may determine a multi-deficiency profile for the older child. There is also continuity in the clinical and biometric aspects of the nutritional condition. They will, however, appear in a much milder form. The reason for this is a general slowing-down of somatic growth between the ages of 4 and 10, and consequently a relative drop in nutritional calorie requirements (in relation to weight and surface area) which represents a 30% drop from the needs of the infants. Needs increase again during the period of growth prior to puberty (about age 11 for girls, 13 for boys), as do calorie requirements. The same applies, generally speaking, to vitamins and minerals. All these details are supplied by numerous international or national tables which vary slightly because they are drawn up in various contexts.

At this age it is found that the child can always satisfy his nutritional needs more adequately than at an earlier age. He is able to absorb and digest the food of adults and to tolerate nutritional inconsistencies. Finally, he is also less prone to various types of 'aggressive' infection. The spontaneous immunization process and the main vaccinations are almost complete. The death rate in this age group has become very low. The common epidemic diseases have a generally low death rate but among deficient children can cause long periods of convalescence and are one of the main reasons for absenteeism from school.

In areas with subtropical climate, however, the high rate of parasitic infections (of the blood or intestine) is a clear or apparent cause of various forms of deficiency,

and rises progressively from preschool age to adolescence. Helminthiases - principally ascardiasis - are very common; hookworm disease is found only locally, (according to figures for Algeria); schistosomioses are found locally and are limited. Protozoal infections (lambliasis, amoebiasis) are common; malaria, generally in the mild form at this age, remains a cause of anaemia and debilitation in some areas.

At this age, therefore, there is still a need for corrective treatment (especially through vitamins and proteins) which should be in excess of the needs of the normal child. The vicious circles nutrition-infection, though milder, are of the same type as at the earlier ages.

7.2 Recent Data

The School Health Services have collected throughout the Maghreb a considerable number of individual pupil record cards, usually quite complete and with height and weight increase graphs. Unfortunately not enough use is made of them and they concern only a small minority of the indigenous population. In Algeria, the 1963 - 1964 surveys by Professor Raoult (WHO) covered some 5,200 children of school age throughout the country. In Morocco, the surveys by Professor Tremolieres (1955), Professor Ferro Luzzi (FAO) and more recently the opinion poll by Professor Raoult (WHO) in June 1967 in the most deprived areas and zones, made possible an evaluation of the situation giving very objective biometric data.

In each country more recent sporadic surveys have shown that the improvement in the pupils' nutritional level, even where there are school canteens, is still very inadequate.

7.3 Predominant Ailments

With their high level of incidence and their presence in all areas, the predominant ailments in all areas are:

1) general under-nutrition
2) after-effects of rickets
3) anaemia.

Among the deficiency syndromes of very variable incidence, limited or moderate protein-calorie malnutrition reappears particularly during the pre-puberty growth period, and avitaminoses, the most common of which are:

1) A avitaminosis (axerophthol)
2) some B avitaminoses (riboflavine - niacin)
3) C avitaminosis.

B2 avitaminosis seems to be spread quite evenly; the others have a more limited geographical distribution depending on the regional food production. Goitre is endemic in the mountain areas in the North West. Fluoroses (of the teeth or bones) affect a group of Saharan population in Algeria numbering some 250,000. Certain resulting syndromes or those related to multiple deficiencies are particularly evident at school age:

1) isolated hepatomegalies
2) chronic parotitis
3) dental decay impairing in certain cases the first adult teeth (6 years)
4) imperfect articulation of the teeth.

Other deficiencies: spasmophilic conditions seem to be very common especially at the pre-puberty stage, but could not be recorded statistically and probably depend on a combination of deficiencies - calcium, magnesium. There is, however, particularly among girls at the pre-puberty stage, a small proportion of glucide and lipide over-nutrition syndromes.

Collective surveys show great regional and local variations, and in the graphs a wide distribution of individual difference, often of a dimorphic nature. This is a true reflection of the distribution of families according to social, cultural and living standards. Deficiency syndromes may be concentrated in a particular family and not affect others. Families in the Maghreb live very much within themselves.

7.3.1 General under-nutrition

The main objective data are the biometric type. Criteria:

- weight (according to age)
- standing height (according to age)
- average thoracic measurement
- tricipital skinfold thickness
- arm measurement
- skull measurement.

These last figures enable various relationships to be calculated:

Height-weight relationship at a particular age (graphic type by Professor Tremolieres (INH) for school-age children in France) shows the general advance or retardation of growth in relation to chronological age. However, as is the case in the Maghreb, height retardation is quite often greater and more prolonged than weight retardation. The results provided in this way are often too optimistic.

Height-thoracic measurement relationship. The main effect of general malnutrition is a clinical condition of lack of weight. The thinness of the skinfolds measured by compasses at constant pressure is the most valuable indicator for measuring fatty tissue. The bicep measurement gives a general impression of the nutritional condition. By a simple calculation it is possible to work out from this the muscular circumference of the arm and from this the active protein content of the body which, in the case of protide deficiency is able to develop independently of the fatty tissue, to the same arm circumference.

Some figures:

1) Weight. - In general it is in the youngest classes in school (5 - 7 years) where weight deficiency is most marked. It follows the deficiency seen after the weaning period. There is a certain recovery about 9 - 10 years. Height and weight development is retarded. An analysis made in the Médéa region (reference INH, Paris, for the French pupil) on 575 boys and girls showed:

Ultra-light (beyond the extreme of the graph)	23%)	below average:
Very light	24.7%)	
Slightly light	24.3%)	72%
Slightly heavier than average	16.8%)	above average:
Heavy	5.6%)	
Above the higher limit	5.6%)	28%

Both in Algeria and Morocco the general average weight is rarely above the normal lower limits (P3). A recent survey in Thenia (Menerville) shows that 59.3% of children between the ages of 7 and 15 years weigh less than the P3 limit. The position is even more serious in Morocco and the Sahara:

Weight retardation (for 1967)

at 7 years:	Rabat -	5.5 kg	(P 30 = 27 kg: retardation 20%)
	Casablanca -	3 kg	
	Rif (mountain) -	3 kg	
	Rif (agricultural) -	1.7 kg	
at 13 years:	Rabat -	6 kg	(P 50 = 42 kg: retardation 16 %)
	Casablanca -	6.1 kg	
	Rif (mountain) -	3.5 kg	
	Rif (agricultural) -	4 kg	

Skinfold thickness (boys)

	5-6 years	8-9 years	12-13 years
Rabat	6.3 mm	4.8 loss 30%	5.5 mm
Casablanca	7.5 mm	5.8	5 mm
North Rif	6.8 mm	4.5 loss 42%	5 mm
South Rif	6.5 mm	4.6	4.7 mm

The reduction in skinfold thickness varies from 17% to 42 % according to the region.

2) Protide malnutrition. - Protide malnutrition is very slight and often latent. Protide malnutrition and general under-nutrition overlap here, and are involved in weight shortage, structural retardation, and psycho-motor deficits and retardations. At this stage of general research they are shown:

- at a limited stage — by muscular inadequacy; by iron-protein anaemia
- at a more advanced stage — by slight oedema; by pellagrous dermatoses.

Muscular deficiency is evident in the great majority of pupils, particularly between the ages of 5 and 7 up to the pre-puberty ages:

- asthenic attitudes: lordoses, prominent abdomen, sunken shoulders, scoliosis
- sign of myo-oedema and particularly too small muscular circumference, even of the arm.

3) Muscular decline during the weaning period may reach 30 to 50% of the normal measurement. At school age (examples Casablanca-Rabat) it continues. The muscular circumference of the arm is on average:

- at 6 years 137 mm instead of 145 mm: loss of 5.5%
- at 8 years 140 mm instead of 160 mm: loss of 12 %
- at 13 years 150 mm instead of 196 mm: loss of 20 %.

4) Oedema. - The puckered skin frequently associated with an acrocyanosis (to be distinguished from chilblains, common in winter) is not at all rare. Examined systematically in the course of our studies, it leads in some groups of school children to centres of hookworm disease.

In Algeria, a recent survey (1968-1969) in the semi-industrial suburbs of Algiers, on approximately 600 children aged from 10 to 13 years, showed oedema rates varying from 5 to 15%. In earlier surveys, rates of 1 to 2% had been recorded almost everywhere.

In Morocco, the survey by Professor Raoult (June 1967) on the poor areas in Rabat and Casablanca and of two particularly deprived regions, North and South, showed oedema rates of:

Rabat	5 to 10 years	4.6%	10 to 14 years	14.4%
Casablanca	"	0.8%	"	1.8%
Rural North	"	0	"	0
Rural South	"	3.6%	"	2.8%.

5) Pellagrous dermatoses. - The effects on the skin are common: dryness, hyperkeratosis or glossy skin on the antero-external side of the leg. Cases of glossitis with bright red tongues are found in the regions approaching the Sahara and the Sahara itself, where rates vary from 2 to 10%. The importance of this should be pointed out as it indicates a deficiency of niacin and trytophan. Lunven recently studied the role of tryptophan in the cerebral metabolism preceding serotonin whose physiological role in cerebral and neuro-vegetative function is known. It has not been possible to study the psychical aspects of these pellagra.

A study on approximately 600 children between the ages of 11 and 13, pupils in the primary classes of 10 schools in the suburbs of Algiers, is being made by Mr. Assela, Assistant in the Faculty of Sciences, in collaboration with the INSP, in order to investigate through several psycho-sensory tests children showing retardation in somatic development or symptoms of various deficiencies.

7.3.2 Other complaints connected with nutritional deficiency

1) Chronic parotitis. - This is a sign either of persistent and chronic PCM or a serious glucid imbalance, most commonly an after-effect of the old weaning crisis (recovery syndrome). It is found mainly between the ages of 4 and 10, with an incidence 'peak' between 7 and 8 years.

In Algeria, in the 5 to 10 years age group (1963), out of 507 examinations: 26 cases, i.e. 5.1% were positive. The majority is found in the Aures (8% on average, at the extreme: 30% Bouzina), in the Sahara (Casis) El Golea 7.5%, Touggourt 6.6%, Djanet 6.3%.

In Morocco, sometimes very high levels are found between 5 and 13 years: Rabat 1.2%, Casablanca 1.3%, North Rif 8%, South Rif 10% (maximum at Dar el Beida 26%).

In general the highest rates of parotitis are found in areas where the undernutrition-malnutrition complex is the most severe during the nutritional crisis at the weaning stage.

2) Isolated hepatomegalies. - The causes of hepatomegalies, of steatosis, fibrosis and hepatic cirrhosis (non-alcoholic), are numerous. Nutritional factors are, however,

involved, even if only primitively (in kwashiorkor as a weakening factor) in viral hepatitis.

Isolated hepatomegaly (excluding malaria) is found particularly in the Domez recovery syndromes - often limited. A number of people have confirmed the persistence of hepatic fibrosis in the older child after the weaning crisis in areas of chronic malnutrition. Undergoing study more particularly in Morocco shows that these true isolated chronic hepatomegalies dominate as parotitis in areas where there is no PCM complex.

For the 4 to 7 years age group:

Southern region -	Ouled sidi Braham	100%
	Dar el Beida	68%
	Ksakis	33%
	Mecissi (nomads)	30%
	Casablanca	30%
	Rabat	22.7%
	Northern Mountains	22.5%
	Coast	11.7%.

3) Infant melanism of the teeth (Beltrami disease), - This is a dystrophy of the teeth enamel found in groups of people whose diet is very unbalanced and contains an excess of glucides. It is found between the ages of 1 and 4 in the upper incisors. The teeth become brownish, fragile, wear away and break. It is found only rarely in the second set of teeth but can cause malformation of them. In Algeria the general rate of incidence is 8%. It is visible until all the milk teeth have been lost. There is no clear regional limitation. The highest rates of incidence have been found in Grande Kabylie (25%), in the Collo region (Constantine) (15%), the High Plateaux, Tiaret (12.6%), Saida (10%), Aflou (9%), in the Sahara rates are low: Laghouat (1.7%), Ourgla (1.1%), El Goléa (0.9%), other centres (0%).

4) Dental caries. - The striking point found during the general studies is the high frequency of isolated caries, or in association with other caries, of the first teeth (the so-called 6 year teeth). This varies according to the regions from 10 to 30%. In Algiers, the Institute for Stomatology shows that the figure is approaching 50%, (information from Dr. T. Siam). The interesting point here is that the intra-alveolar calcification of these teeth takes place at between 6 and 30 months, that is precisely during the weaning crisis. There is a tendency to consider the weakening of the tooth, then the caries itself, as the effect of a nutritional crisis impairing the synthesis of the hydroxy apatites in the enamel, occurring well before the eruption of the tooth (Dr. T. Siam). This is only one of the many examples of the far-reaching effects of the weaning crisis.

5) Growth retardation. - There is no doubt that in the middle and long term the height measurement (standing-sitting) is the truest guide to nutritional content during growth. Less liable than weight to the influence of accidental or temporary circumstances, it reflects in the pre-bone and bone tissues metabolic and endocrine deficiencies and disturbances, linked in turn with the absorption and use of various metabolites and enzymes necessary for this development. Deficiency factors in height growth are amino-acids, minerals, vitamins, the balance between CAIP, etc. Height growth represents the sum of their effectiveness, bearing in mind

genetic programmes. Generally speaking height growth retardation is, within this frame a reference, more marked up to adolescence than weight retardation.

6) Avitaminoses

Rickets. - As recent surveys have shown, rickets is found in the Maghreb at an early age, frequently (from 30 to 60% between 3 and 18 months) and is often very severe. At school age, during the period of reduced growth rate, hardly anything more is observed than the after-effects (deformation of the skull, thorax, limbs). In the severe forms in childhood, rickets tends to regress spontaneously between the ages of 3 and 5, during the period in which the child spends more time out of doors and is freed from excessive clothing. However, it is found in the same environments and areas where rickets in young children reaches a hyperendemic level, among large numbers. Rickets is partly responsible for growth retardation.

Incidence of rickets

In Algeria, from 8 to 13 years	Grande Kabylie	23%
	Medea Mountains	33%
	Northern Aures	40%
	Oasis	50%
In Morocco, from 5 to 15 years	Rabat	26%
	Casablanca	27%
	Northern Rif	14% mountain 52.3% coast
	Southern Rif	45%.

It was not possible to carry out an external pelvimetry examination of the girls.

Vitamin A avitaminosis. - Hemeralopia (or nyctalopia), an early symptom of axerophtol deficiency, is common in the areas approaching the Sahara, in the high plateaux of Algeria and in the south of Morocco. It is difficult to distinguish the parts played by deficiency in animal vitamin A or in carotenoids from vegetables, by deficiency in fatty acids and by chronic irritations of the ocular mucuous membranes and of the skin. These are complex deficiencies. However, when examining older children it was found that there was: thickening of the conjunctive, Bitot's spots, and indurated, symmetrical follicular hyperkeratosis.

In Algeria the greatest number of these symptoms was found in the areas approaching the Sahara, in the Sahara where there is a cereal monoculture, or where fruit and vegetables are not available or are in short supply for long months. The coastal, marshland and forest areas are almost completely free of it. In Algeria, the highest rates of incidence are found south of the Alfa line: 40 to 50% in the Talagi, El Aricha areas, approaching the Sahara, 28% in the Alfa zone, 4% in the rich cereal high plateaux. In the Aures the situation differs between the bare summits (18%) and the valleys where the figures drop to 4% and even 0% in the canyons where apricots are grown. In the Sahara (Oasis) figures are high: 25% on average, the lowest being (5%) at Ghardaia and the maximum at Ouaragla (58%). In Morocco, figures are relatively low in the large towns where there are good fruit and vegetable markets., On the other hand, avitaminosis is prevalent in the northern and

southern areas where multi-deficiency conditions are common at all ages. For the 5 to 14 age group figures are much higher:

North: from 5 to 10 years 4.6%
from 10 to 15 years 6.9%.

In the centre of Dar el Beida the figures for follicular hyperkeratosis in 10 to 15 year-olds are high, reaching 50%.

Vitamin B avitaminosis. - Thiamine deficiency (vitamin B1), the cause of endemic beri-beri among rice-eating peoples, is practically non-existent in North Africa. On the other hand riboflavin (vitamin B2) deficiencies seem to be extremely common in all environments. They generally accompany, despite the ample supply of certain fruit and vegetables, diets deficient in animal proteins (eggs, meat, offal, milk).

The essential rôle of B2 in protide-glucide metabolism is well-known but its clinical translation, isolated by means of experimental deficiencies in animals, is moderate and disputed. The B2 vitamin has an important physiological and histogenetic function for the eye: it intervenes in the mechanism of diurnal vision and in the trophism of the optic nerve.

Vitamin B2 deficiencies cause ambylopia (nutritional or tropical ambylopia), lesions of the cornea (superficial lesions) (nephelions), peri-limbic hypervascularisation with photophobia. Vitamin B2 could therefore play a not insignificant part in ocular pathology, most often in synergy with other nutritional factors (proteins, vitamin A).

The coexistence of these deficiency factors in the areas where trachoma is endemic gives reason to believe that, when there is an equal level of infestation, the greatest proportion (Dr. Moday of the WHO) of retardation and cicatrization defects of the trachoma affliction of Northern Africa could be mainly attributed to these local conditions. Riboflavin deficiencies cause trophic disorders of the muco-cutaneous joins (corners of the mouth, eyelids, nostrils). Very marked in the serious forms of protide malnutrition, they are milder in older children. During rapid examinations, the eye test is not usually detailed enough to discover this.

However, symmetrical angular cheilitis and central depapillating glossitis are two factors easy to find. These factors are common generally, both in Algeria and Morocco, with no very clear regional predominance.

In Algeria (Professor Raoult, 1963-1964) the total figure for the age-group chosen (5 to 7 years) is 14%. Higher figures were found in Grande Kabylie (29%), Aurès (21%), Oranie (27%), in the Sahara (Oasis) 12.8%; it is practically non-existent among the nomadic shepherds.

In Morocco (Professor Raoult, 1957) the following were the figures (5 to 14 years:

Rabat	17.8%
Casablanca	14.1%
Northern Rif	23%
Southern Rif	20.5%.

The extensive parasitic infection interferes with not insignificant intestinal biosynthesis of vitamin B2, and may cause so-called competition avitaminosis in

lambliasis, ascaridiosis, etc. The importance of these symptoms is their association with restricted chronic protide malnutrition whose existence they externalize.

Pellagra. - The same applies to pellagra symptoms.

Vitamin C avitaminosis (ascorbic acid). - Linked with an inadequate intake of citrus fruits and fruits and vegetables rich in ascorbic acid, these deficiencies also occur as a result of ignorance, of the too high cost of these foods in the towns, or of climatic conditions unsuitable for their regular production (sub-desert and desert regions). At school-age they appear in a minor form, that of periodontisis, in which they are one of the main factors, and which in Algeria is more important than dental caries. It is difficult, except by using the generally conclusive therapeutic test, to separate the rôle of bad mouth hygiene and of multiple deficiencies conditioning gingival eutrophy (vitamin C and P, B2, protein). The clinical sign established was: swollen gums, bleeding spontaneously or on slight friction.

In Algeria, north of the Sahara, important figures for school-age children were only found in the areas approaching the Sahara (from 3 to 5%). In the Sahara (Oasis) 3% average, but very variable from no incidence in Bhardaia to 16% for the Ouargla region.

7) Mineral deficiencies

Deficiency anaemia. - The main, dominating, forms of deficiency anaemia are iron deficiency, and anaemia from mixed deficiency of folic acid and protein. Other factors in cell growth, maturations, red blood corpuscles and haemoglobin synthesis also play a part (amino-acid deficiencies) or interfere with absorption, storing or metabolism of cell constituents. According to the globular value (g.v.) the average diameter of the red blood corpuscles, it is possible to distinguish hypochromic anaemia, usually macrocytic, normocytic anaemia, macrocytic anaemia and nefaloblastic hyperchromia. These different types of anaemia are generally erased by adequately balanced and varied diets. In the face of individual or regional situations, advice can be given, or the preventive distribution of preparations with an iron or folic acid base can be organised in the P.M.F. centres.

Various forms and degrees of anaemia may be included in multi-deficiency syndromes such as those of malnutrition (PCM), of rickets and of hematogenous infections and parasitism (e.g. malaria).

Anaemia from iron deficiency. - In the Maghreb, two age-groups are particularly affected: infants and young girls (earlier known as 'chloroses').

It occurs when there is a combination of

1) very deficient diet
2) increased needs
3) defective intestinal absorption
4) implanted blood spoliation.

General surveys are very inadequate on this problem because of the lack of mobile laboratories. A single clinician may note excessive pallor but this leaves too much room for personal judgement. In Algeria mild forms of anaemia are common in school children. In Morocco (1958) Professor Luzzi, basing his work on the examination of 2,570 school children between the ages of 5 and 12, notes 'pallor' in 17.5% of the pupils and finds as an accessory pathogenic factor, geophagy, and as the main factor, iron and vitamin C deficiencies. The anaemic conditions prolong

general debilitation and, because of the cerebral and cardiac anoxis which they cause, are an important factor in low school performance.

Some recent research has shown that these anaemic children have in general an IQ 40% below the average for normal subjects.

Endemic goitre. - Endemic goitre is connected with a diet deficient in iodine or containing antithyroid substance. Its presence in Algeria and in Morocco is generally acknowledged. In Algeria, goitre affects a territory covering 4 million inhabitants (one third of the population in the west of the country). Systematic surveys have shown that it appears at school age, at about 7 to 8 years. From all those examined in 1963, Professor Raoult has collected the following figures from 8 to 13 years for: Collo Mountains 5.9%, Beni Yeni 43%, L'Arba 20%. The reduction in growth rate and mental development of the child have not been studied sufficiently. Congenital myxoedema, and myxoedematic mental deficiency seem to be rare, as does deaf-and-dumbness. There is also a large area where goitre is found in the mountain region of Rif in Morocco.

Endemic fluoroses. - Excessive fluorine in drinking water and vegetables creates in the Ourgla-El, Oued-Touggourt triangle, a large centre of dental and skeletal fluorosis, affecting a population of some 250,000. The 1963 surveys (Raoult) were continued by specialists of the Dental Institute in Algiers and supplemented by studies by local doctors on osteopetrosis. Marble teeth are easily recognised in the second set of teeth. In all, 20% of school-age children in the Oasis (out of 642 examined) show dental fluorosis to a greater or lesser degree of severity. The highest figures were found in M'Raier 45%, Ouargla 44%, El Oued town 20%, farther south in Tamanrasset 21%.

7.4 General Consequences of Nutritional Deficiencies

There is no tissue, no apparatus where it is not possible to see growth retardation, functional disorders, permanent lesions and after-effects of earlier crises of nutritional deficiency in the child. The school child is a 'survivor' who may have been permanently handicapped well before he begins to attend school. The still incomplete facts which are available to us only concern the clinical consequences of earlier deficiencies, and of those whose effects continue to accumulate. School age is the time when formal learning makes its great, sometimes brutal impact and the educational process is continued, which begun at birth and which was intensified from the time the brain almost completed its structural and functional development (towards three and a half years). Nutritional needs still remain, relatively speaking, much higher than those of the adults and remain selective (group B vitamins, some aminoacids). Recovery from earlier somatic and mental retardation - unless they were irreversible - could only be made if the family diet were supplemented by essential materials. School behaviour, ability, memorisation and concentration are permanently related to full physiological development. Absenteeism due to low resistance, infection, and prolonged periods of convalescence should also be considered. We have seen that for the average child in the Maghreb nutritional conditions are far from satisfactory.

A new vicious circle arises from recent research on the consequences of early malnutrition. Cultural retardation breeds malnutrition. Does malnutrition breed cultural retardation? This topic was the subject of a UNESCO conference held from 11 to 15 May 1968 on the brain and human behaviour.

7.5 The Effects of Malnutrition on Psycho-motor Behaviour

In the areas of North Africa where systematic surveys have been made, the children who reach school age can be considered to be the 'survivors' of the great nutritional crisis of early childhood. Between birth and five years at least a quarter (25%) of their brothers and sisters will have disappeared. Depending on the environments and regions, from 10 to 60% of children between the ages of four months and three years passed through a period of marked under-nutrition (average approximately 25%), 75 to 100% remain small and light by international standards.

Protide malnutrition of the 2nd and 3rd degree is added to these figures to the extent of at least 5% at one time, sometimes before this critical period. Vitamin and mineral deficiencies must be added to this basic picture. The whole is not to be separated from multiple infections and parasitic diseases, thus forming a vicious circle of malnutrition-infection.

In the Maghreb there is no break between the child who has survived the nutritional crisis and the one who goes to primary school at 6 years of age. Sanitary and nutritional conditions of the child within his family remain the same. But growth rate is relatively slower at this age, food requirements are lower, more easily satisfied, the digestive tract and enzyme metabolism systems more efficient, and immunisation is more complete. Weight and height retardation, however, are considerable. The development of the skeleton (skull, thorax, limbs) is below normal, and irreversible visceral lesions may be present. Between the ages of 3 and 5 the child slowly makes up for what he has last. From the age of 6 up to puberty, however, he still shows height-weight retardation, marked muscular deficiencies and clinical signs of earlier after-effects. The great majority of school-age children have still not made up for this retardation or eliminated the after-effects during their time at primary school (6 to 14 years).

In relation to chronological age these retardations in physical development become noticeable between one and a half years and three years (on average two years) in the groups studied. Under-nutrition, protide malnutrition, vitamin and mineral deficiencies persist but are better tolerated from the survival point of view.

What are the effects on school performance? We lack exact data which would enable us to assess absenteeism, the rate of class repetition, the average level in the different classes, and examination results. Is there mental retardation parallel to somatic retardation? Is it permanent? General systematic studies by psychologists in this field are almost non-existent in North Africa, or they are little known and unused.

7.6 Data on Children affected by Malnutrition

Clinical and biochemical, histological and electroencephalographic studies on children affected by serious nitrate-calorie malnutrition lead to the conclusion that there is serious impairment of cell and extra-cellular structures of the brain, and metabolism and functional disturbances during the most critical stage.

Some observers have noted rapid and complete recovery in children affected at a later age. Others (Dean) find that the electroencephalograph tracing remains abnormal even after a marked recovery. However, here it was a question of the most serious forms of kwashiorkor, usually appearing between the ages of 1 and 3 and affecting, statistically speaking, only a small minority of the population; moreover,

these cases are condemned to death unless they receive hospital treatment. What happens to these who survive moderate but prolonged forms of under-nutrition malnutrition, multi-deficiency states, observed at an age when the brain volume is still increasing in comparison with the volume at birth, by about 30%, and, between 6 months and 3 years, by an average of 12%? (The skull measurement gives an indirect guide to brain volume).

Figures on 110 children of from 6 months to 4 years of age among two poor population groups with the same ethnic origin and of a low cultural level in Morocco, show that the development (average skull measurement) suffers prolonged retardation, bringing the average retardation at 2 years to 3.5 cm., i.e. a 7% deficit. This deceleration causes the same drop in the collective graphs as the height-weight biometric indices. Brain development retardation at the age of 3 is 18 months in relation to chronological age. At 3 years the brain should have reached 80% of the volume of an adult brain. There is a certain recovery between the ages of 3 and 4 years, a period when brain growth is usually slower. At 4 years there is still a retardation of about 1 year.

If this is the average figure, the skulls of 50% of the children in the group are more severely affected in their growth. This supports previous observations on the 75 undernourished populations in the Third World. School age children there are smaller, they reach puberty later; pre-puberty height growth increase is retarded in Morocco and Algeria by an average of one and a half years.

The intelligence coefficient of children from an environment with a low cultural standard and inadequate level is generally low, but it is in turn the result of genetic, sanitary and social factors, such as a lack of encouragement and education during the first years of life.

Looking at recent work we can quote that of Cravioto, de Licardi and Birch (1966, i.), who investigated the performance of school-age children in Mexico, coming from the same ethnic origin and the same economic and cultural environment. They compared the results of a certain number of tests using inter-sensory association mechanisms (interpretation of visual, kinetic and haptic perception). They found that children whose height growth had been checked by earlier malnutrition made mistakes much more frequently than children with normal growth development. This was not found (Cravioto, INCAP, Guatemala) in connection with height growth retardation linked with ethnic factors in well nourished families.

From the present state of research on the after-effects of serious or moderate malnutrition it appears that retardation in mental performance is generally of the same kind as retardation in somatic development, particularly of the skull; - that retardation in somatic growth is the result of early malnutrition and is partially irreparable; - that it is transmitted from one generation to the next (reversed selection); - that the early onset (before one year or even before six months and the prolonged duration of under-nutrition and malnutrition leads to complexity and persistency of retardation; - that treatment by 'recovery' diets is not adequate to make up for that retardation.

Dr. Winick (University of Chile in Santiago) showed that the brains of children who had died from marasmus (severe malnutrition) before the age of 1 year, have appreciably less DNA and therefore fewer brain cells. (Brain cells are not renewed in number.)

However, with children one cannot be too positive until the precise rôle of other factors in the deterioration of performance, learning and behaviour levels, such as environmental, infectious, economic, cultural and affective factors, is known. A longitudinal study is being made in Guatemala (INCAP) under the direction of Professor Cipriano Canosa and with the aid of the National Institute of Child Health and Human Development (US) in order to examine the incidence of these various factors. The preliminary results of this study (Caracas, 1st April 1969) show that a child having suffered a period of malnutrition who is given a battery of ten psychology tests, provides less satisfactory responses to the four tests which involve an appreciation of short-term memory and learning capacity, if the test is given within a short space of time. Observers feel that ability to concentrate has been reduced by malnutrition.

7.7 Experimental Work on Animals

The brains of all mammals go through identical stages of development which depend mainly on the time required to reach maturity. The brain of the human child has reached 80% of its adult weight at 3 years. This period of 3 years after birth corresponds to 8 or 10 weeks for pigs and 4 weeks for the rat. In the full-term child, who did not suffer fetal malnutrition, all nerve cells are present but biochemic maturity is only approaching completion at 2 years. During the following years inter-cellular connections become more complex and the supporting tissue (neural) develops. Only at six years has the brain effected 80 to 90% of its growth.

Underfed rats or pigs have much smaller brains on maturity than well-fed animals. The same seems to apply also to other mammals (dog, chimpanzee). The earlier deficiencies intervene, the greater the retardation. These volume changes are accompanied by impairment in the form and distribution of nerve cells in the brain and lower performance in various learning and behaviour tests. Unbalanced diet and protein deficiency have a greater effect than simple under-nutrition.

Receiving compensatory nutrition for two and a half years, pigs which were underfed between the ages of two weeks and one year had smaller brains, incomplete myelination, nerve fibres and biochemic differences which persisted even after somatic recovery. The same factors were found in rats where the litter was too large for the mother's milk supply.

Using a diet with protein shortage and reproducing in pigs human kwashiorkor, Platt discovered anatomic lesions like those described above, and abnormal electro-encephalograms.

The effects of protein deficiency on performance may only be shown in the offspring and grow progressively worse from the first to the second and third generation if the same diet, deficient in protein, is maintained (Cowley).

Winick measured the total brain DNA (nucleus of cells) and found that for every species the DNA measurement in an organ indicates the number of cells. The brain cells of rats, underfed during the first two days, were permanently reduced but not if the under-nutrition intervenes only later. Moreover, if the mother rats had been chronically underfed during their life, their offspring were small and had a smaller number of cells. However, if under-nutrition only intervened during the gestation period the offspring was normal as long as it was suckled from birth by a well-fed animal. These observations therefore support those made in the child.

7.8 Conclusions

There are serious consequences. The children who are underfed today will be young adults by 1990 and on them will depend the economic and social progress of these countries. If the retardation in mental and physical development which they are experiencing now is indicative of a certain degree of permanent mental deficiency, and if this mental deficit slows down, impedes or stops school learning, then vigorous programmes for preventing and combatting malnutrition are called for. They must not only make up for present 'under-nutrition and malnutrition', but above all prevent nutrition crises in the new-born. For this action must be taken on all factors which, when combined, cause both malnutrition and delay in mental development (cultural environment, etc.). There is, however, no doubt that in the immediate future governments will be more able to act rapidly on the question of diet than on the other factors.

The main crisis remains the weaning stage but a child's future is already conditioned by the nutritional condition of the future mother and by the condition of fetal nutrition. If, however, a child is well fed from birth its chances of development seem to be ensured.

Early immunization by vaccination considerably reduces the rôle of infection in the occurrence and aggravation of bad nutritional conditions.

In the young child, the weaning crisis may be prevented by a diet which covers the normal nutritional needs and the additional needs called for in disease and recovery. This may be achieved by an early, varied diet, with a particularly good protein content, making the best use of family and national resources, or using complete industrial weaning foods: at the same time maintaining the great advantages of breast feeding for as long as possible; by teaching infant dietetics to the public, mothers, future fathers and mothers in the primary school; by training medical, social and educational staff to carry out this education.

The permanent supervision of vulnerable groups provides the proof and the basis of this work.

At school-age the school canteen and the educatonal school restaurant may provide the necessary food supplements and make up as much as possible for accumulated retardation, or at least preventing new ones from occurring.

8. CHILD DEVELOPMENT IN SENEGAL IN THE FACE OF MALNUTRITION AND INFECTIONS

V. DAN, P. SATGE, A. DEBROISE, J. VUYLSTEKE

8.1 Introduction

Because of its geographical position and the diversity of its several main regions, Senegal is typical of a well-defined African country, south of the Sahara. It is therefore a valid example for the general situation in West Africa from the demographic, economic and educational points of view.

The topic which has brought together international experts at the Unesco Institute for Education in Hamburg is the important one of the health of young people in developing countries. The date of this meeting corresponds to the beginning of the second decade of development in our countries.

To avoid hasty conclusions being drawn from approximate assessments, or extrapolations, difficult to justify, being used as a basis for programmes of child protection undertaken by governments, the Institute for Social Paediatrics of the University of Dakar has been endeavouring for six years to collect accurate data on the main problems facing paediatricians in West Africa.

In Senegal, as in the other countries in West Africa, the age group between birth and 15 years accounts for 45% of the population. This section of the population represents a human capital of which we must take the greatest care because on it depends the future of our country. We therefore need a coherent policy for childhood, the main lines of which are: that the child does not die; that he is adequately fed; that he acquires knowledge; that he learns a job and practises it effectively.

This means training man for his social rôle as a producer according to his abilities. This is a long and continuous process and it only needs the intervention of some handicap at one point in his development for the rest to suffer. Our research has shown that in the course of this process, a pathological handicap is of vital importance. We have not yet been able to assess all the consequences of such a handicap. What is certain, however, is that the pathology of the Senegalese child is dominated by malnutrition and infections.

In order to assess the importance of malnutrition we examined it in two ways. The first way was by studying the children in the care of the Paediatric Department of the University Hospital: this covers mainly the poor sections of the urban population. The second way was through research on children living in their traditional environment in the rural zone.

8.2 Malnutrition in the Urban and Suburban Zone of Dakar

(Information taken from the files of the Paediatric Department)

In our Department 80% are seriously ill children from Dakar and its suburbs, and 20%, who are suffering from subacute or chronic diseases, come from more distant regions. An assessment of malnutrition in our sick children can give an idea of the situation in the Dakar area. (Our hospital services provide for about three quarters of the population in the area.)

We made our assessment in different ways:

1) Kwashiorkor in hospitalized children (Table I). - Kwashiorkor, by its real name 'kwashi-kaw-kaw' (child marked by fate) is, we feel, a good indicator of malnutrition. It is easily diagnosed because this nutritional disease is clearly defined on the clinical and biological levels.

The rise in the number of cases of kwashiorkor between 1958 and 1966 in relation to the total number of hospital cases, which on average remains practically the same, whilst the capacity of our hospitals is overstrained the whole year, and whilst we do not admit kwashiorkor cases any more readily than others, should give us reason for concern.

This disturbing state of affairs may be explained by the fact that the population in the Dakar area increases by 9% each year whilst the number of medical staff and clinics remains about the same. Supervision of the children and education of the mothers therefore becomes more and more difficult.

2) Under-nutrition in hospitalized children (Table II). - The extent of under-nutrition may be established by considering the average weight of children on admission to hospital and comparing them:

- either with the average weight of children of this age in the area, and against an internationally accepted scale,
- or against each other, separating into two groups the children who recovered and those who died.

It has been found (Table III) that the average weight of children is appreciably lower than the Dakar level, which is in turn below the international standard for healthy children but, furthermore, the weight on admission of those who died is 15 to 20% lower than the weight of admission of those who survived.

All things being equal, the degree of under-nutrition on admission bears heavily on the prognosis.

3) The influence of nutrition on the progression of the mortality rate according to age (Table IV). - We grouped cases together according to their age at death. The first month must be considered separately as there are special causes of mortality here (neo-natal infections, obstetric causes, malformations, etc.).

The death rate between 1 and 6 months and 6 and 12 months decreases from 31.79 to 28.04%. From then on the important fact to stress is that the rate will rise, reaching 32% between 12 and 18 months, then 35% between 18 and 24 months, for the same number of admissions, about 450 in each age group. Statistically, the differences in percentages are significant. This progression is completely paradoxical. Moreover, it is unusual in developed countries.

In our case, the importance of infections cannot be denied after the first month. We discovered infectious aetiology in the majority of our deaths. As the children all come from the same environment, errors of hygiene are committed with equal frequency and the children are exposed to the same infectious diseases. Though the first 6 months of life may be excluded, as during this time the infant is protected against some of the diseases by the antibodies transmitted from the mother, this factor is no longer present between 6 months and 2 years.

It must therefore be admitted that a factor other than infection is involved if the increasing death rate is to be explained. This other factor is more important than infection because as the child grows his defence system against infection develops and the number of deaths from infection drops, as is also the case in Europe. This more important factor is nutritional deficiency.

Indeed, (Tables III and V), if the weight of the Dakar child is compared with that of the European child, it is found that the former separates from that of the European child at between 8 and 9 months, so much so that at 18 months it has a retardation of slightly more than 1,500 grammes and at 24 months almost 2,00 grammes.

It is at the point where the weight curve has been static for several months and where the child has no doubt exhausted his reserves, that mortality is highest. We checked this fact in all the sick children in our Department, whatever the aetiology (infectious diarrhoea, respiratory infections, parasitoses, etc.). Thus, whether mortality in our Paediatric Department is considered according to the weight of the child on admission, his age or the aetiology concerned, the nutritional factor seems to be a basic element, mainly responsible for the high death rate.

8.3 Results from the Observation of a Community of Children in a Rural Zone

With the aid of the International Children's Centre, an Observation Centre was set up in Khombole, 100 kilometres east of Dakar. In this Centre we can train medical staff and assistants in rural medicine.

75% of the population lives in a rural environment. Our research covers six villages including approximately 2,000 children between the ages of 0 and 10 years. We take notes of the pregnancies, births and deaths; the children have been regularly examined by us since 1st January 1964.

We have collected various basic data from which two essential aspects emerge: the first is the importance of under-nutrition and protein malnutrition; the second is the importance and multiplicity of infections. These are the two factors responsible for mortality in rural areas which we should like briefly to analyse (Tables VI and VII).

If we compare the mortality per year according to age between birth and 5 years with that in eighteenth century France, we find that mortality in infants is identical in each case. As both groups are fed in the same way during this period (breast fed only) an identical death rate means that factors intervening from the external environment are of equal importance. However, after this, the death rate is higher between 1 and 5 years and only drops appreciably after two and a half years.

Here again it is the weight curve which can provide the explanation (Table III). Comparing on this graph the average weight of a normal child in Dakar, that of a child in a rural area (Khombole), and the norm in Paris, it is found that the weight of the child from the rural area is 10 to 15% below that of the urban zone in Dakar. The deficit in relation to the average weight in Paris is even more pronounced.

We have no survey relating to food which gives us the portion taken by the child, but we do have a survey on consumption per family during three different periods of the year in villages of the same ethnic origin, with the same population

density, and similar from the agricultural, economic and cultural points of view; the survey was carried out by the O.R.A.N.A. (Table VIII).

Thus it is evident that malnutrition forms the background against which all the dramas in the development of the child are played out. Against this background repeated infections (diarrhoea, infections of the respiratory tract, malaria, measles, etc.) are an aggravating factor, not only because of the anorexia, but also because of the supplementary protein katabolism which they involve.

The combined result of malnutrition and infections in rural areas is shown by the disappearance of half a generation before the age of 5 years. Table IX shows this by means of the number of survivors between 0 and 5 years.

8.4 Observation of a Community of Children Living in a Suburban Environment

In order to gain a total picture of the problems of childhood we began to observe a community of children in Pikine, a suburb 15 kilometres north-east of Dakar. There are 110,000 inhabitants in this suburb of whom 25% are between the ages of 0 and 4 years.

In 1968 we began to follow the children in two well-defined zones. The data we have available are still limited. The estimated infant mortality rate is to 82%, comparable to the infant mortality in Dakar.

In 1971 the Institute for Social Paediatrics built a Centre for Child Health in this suburb with the aid of the European Development Fund. One of the activities of this Centre is to carry out, from the end of the year, a special longitudinal study on the psycho-motor and mental development of children who have suffered from protein malnutrition.

8.5 Analysis of the Main Causes of Protein Malnutrition

As the majority of kwashiorkor cases in Dakar come from the most deprived sections of the population living in slum areas, it is important to note that these areas are the normal refuge of new immigrants who have left their tribes.

An analysis of 1,072 cases of protein malnutrition brings to light certain epidemic features which we were able to follow up by a psycho-sociological study of 30 families.

1) Age at onset. - More than 80% of the cases occur between the ages of one and two and a half years, the highest rate of incidence being between 15 months and 2 years. Weaning has generally taken place 1 to 3 months previously and in cases where it was earlier, questioning reveals the chronic and long-standing nature of digestive troubles, as well as an almost exclusively carbohydrate diet. A period of infection, particularly measles, was often a factor in triggering off the trouble because of the traditional habit of withdrawing all protein foods while the diarrhoea lasts.

2) The seasonal influence. - This is shown when the cases are classified according to the months of the year. It is much more marked in rural areas where the highest incidence is in the hot and humid season when the drop in food availability is combined with an increase in enteric and malarial infections.

3) Social factors. - By grouping the kwahiorkor cases according to zones and the profession of the father it is found that:

- kwashiorkor is not the exclusive prerogative of the poorest classes and is found among farmers and fishermen as well as among wage-earners;
- the number of kwashiorkor cases is three to five times lower in the urbanised areas and in the stable and traditional areas.

A more detailed survey of 30 urban families shows that the parents were born in rural areas and came to the town when they married; during the difficult period of adaptation to urban conditions the traditional systems are disturbed.

In the same way, wage-earners have adopted a less traditional way of life and the farmers whose children suffer from malnutrition have come to the town to look for work during the dry season, and so find their traditional way of life disturbed.

As concerns food taboos, they are not as much of a religious nature as is supposed. They are mainly connected with family and social ideas in the desire to educate the child well.

8.6 The Effects of Malnutrition on Later Development

Our research has enabled us to observe the following phenomena:

1) Repercussions on weight increase. - After hospitalization there is a great weight increase. This is more marked in girls than in boys (Table X). The retardation curve for percentage deviation by comparison with the Dakar norm shows this up clearly. Then between the ages of 5 and 8 years there is a period of regression, until from 8 to 9 years the retardation is recovered gradually, with the boys this time being more advanced.

2) Repercussions on height growth. - Height growth also improves but not quickly enough to compensate for the retardation, so retardation in relation to the norm increases further. When this is expressed in terms of weight deviation in relation to height it is found that this relation improves very quickly as the weight increases much more rapidly than height; the child therefore achieves a balance and is apparently in harmony. But though the relation may become normal between 4 and 6 years the weight and height development of these children is at least one year behind their actual age.

Between 6 and 7 years weight growth is smaller and only at puberty is the balance re-established, so that weight and height are those of a normal child in the country. The age at which children reach puberty is the same in those affected by kwashiorkor as in normal children.

3) The cephalic circumference. - The most disturbing observation is that of the development of the cephalic circumference (Tables XI and XII). The difference between the cephalic circumference and the norm for the same age in Dakar increases up to 5 and 6 years of age.

By entering all our 112 observations on the graph showing the normal curve, we find that although most of the growth of the skull is achieved before 5 years, this growth is severely retarded in the cases affected by kwashiorkor. We also find that the retardation is only made up in a few cases between the ages of 12 and 15. It is therefore clearly this parameter which is the most severely affected.

Our observations relative to psycho-motorial behaviour in children, though very fragmentary, do make it possible, by putting them in the context of the observations on somatic, and therefore physical, development, to stress the more general handicap that the child may be subject to.

Certain factors should be examined in connection with the possible effects of malnutrition and infection on psycho-motorial and mental development of children who, though they may have escaped death, may nevertheless suffer severe handicap for a long time.

Few accurate figures can be given on this subject as various factors are involved at the same time: the intellectual level of the parents and the whole environment, the family context, the social context, the competence and quality of the teachers, the degree of integration of teachers and parents in the socio-cultural life, and finally the economic level.

Without wishing to make any extrapolations, we are concerned with two main factors: the number of pupils who repeat the primary classes and the number who drop out. Table XIII shows the failure rate in Senegal schools for 1967 - 1968.

In addition, all the paediatricians were struck by the fact that if the African child follows the same stages in his psycho-motorial development as the European child he is constantly 6 to 8 weeks, or even more, in advance during the first year of life. However, during the second year there is a slowing down, if not a complete stop, at the traditional weaning stage which is usually harsh.

8.7 Remedies

It seems that solutions have too often been put forward which, however logical and useful they may have seemed in a particular situation, could not alter the nutritional and cultural context or completely repair the effects of the environment. Remedies should take account of the countries and regions concerned, the reactions of the population, local food resources and so on. The prevention of infection relies to a lesser extent on vaccinations because they only affect a limited number of aetiologies. Prevention should primarily be based on measures to improve living conditions and general hygiene.

In the rural zone there is a need for cleanliness of the home, sinking wells, general cleanliness of the wells and the surrounding area, protecting the purity of the water taken from the well to the dwelling against being polluted in the receptacles used, making latrines, prevention of malaria by use of prophylactic drugs.

In the urban zone there is a need for planning healthy living quarters to replace the insanitary ones, supply of non-polluted drinking water, removal of stagnant water, refuse and sewage, etc.

We are aware of the importance but also of the cost of such measures. The time necessary for their introduction depends on financial resources.

The need for an education in nutrition adapted to the beliefs of the population and their attitudes is also evident. In our rural zone 55% of the children joined the group considered physiologically normal as against 31% at the beginning of our work. Local food resources must be adequate. In many places, despite good collaboration with the villagers, we cannot improve on our results. Thus in any

particular situation their is a certain limit to the effect of medical work. This is why we have begun, at the local level, to work together with the agricultural services, offering education in housecraft, and contributing to rural development.

These inter-sectorial, multidisciplinary activities are carried out under the existing structures with the staff available in the country; but we guarantee the support of technically well-trained staff with wide field experience.

This programme is being used in Senegal in experimental development sectors, directed by the Centre for Tropical Agronomic Research. To the Institute for Social Paediatrics and the research possibilities of the Faculty of Medicine are added the efforts of the local people in improving the nutritional standards. For it is indeed the peasants, farmers and fishermen who can supply the people with the food resources they require, because only when the family as a whole has enough to eat will the most basic needs of the children also be supplied.

We should like to stress three important aspects in our programme for public health:

1) While the improvement in hospital and clinic services has helped considerably in reducing the effects of infections, we have used the medical assistants to form mobile teams, leaving the clinics and going into the towns and villages to meet and work together with local workers. Among these local workers the midwife is an important person for us. Collaboration with the primary school teacher is also indispensable.

2) These auxiliaries should be organised by a well-trained doctor who, rather than simply treating the sick, should devote a large part of his time to supervising this mobile health service.

3) The introduction of centres for nutritional recovery and rehydration, attached to the clinics, is necessary so as to give early treatment to the chronic cases. This would have the advantage of avoiding the intervention of the hospital services. We are beginning to establish such centres.

Special attention should be given to pre-school children because it is during this period that half the mental, affective and social development is completed.

8.8 Future Action

At the completion of this wide survey, further research will be necessary during the second decade of development in our countries. The aim of this research will be to establish with accuracy the various scholastic and mental handicaps which can result from the combined effects of malnutrition and infections.

In Senegal the Institute of Social Paediatrics of the University of Dakar has, as we have mentioned, already built, with the aid of the European Development Fund, a Centre for Child Health in Pikine where such research can be undertaken successfully, firstly at local level. For such a programme to be carried out, the support of associations of international or bilateral aid is required which, by supplementing the financial contribution of the government, could give us the necessary aid and qualified research workers to join our group.

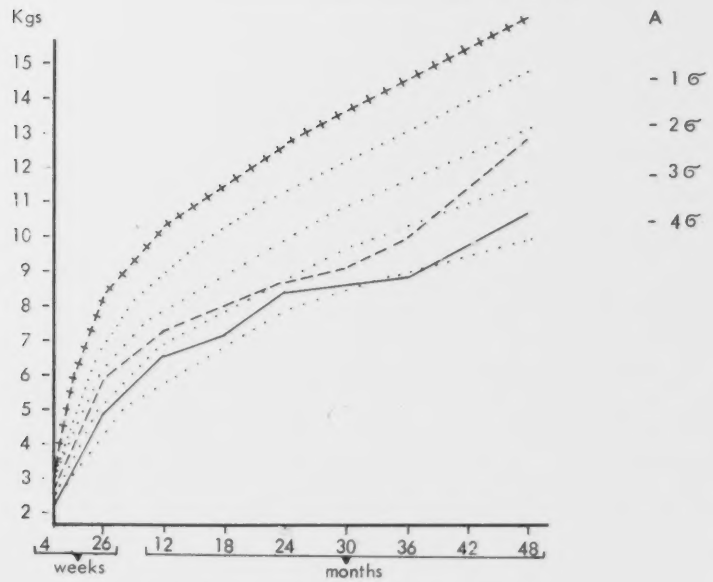
TABLE I

Kwashiorkor in Hospitalized Children

Years	Number of patients	Number with kwashiorkor	Percentage
1958	2,518	94	3.7%
1960	2,177	118	5.4%
1962	2,387	151	6.3%
1964	2,579	300	11.6%
1966	2,193	320	14.5%

TABLE II

Under-nutrition in Hospitalized Children



+++ Average CECDE Paris
Average weight of children hospitalized in 1964
-- 1) who recovered
—— 2) who died
... Standard deviation (σ)

TABLE III

Average Weights of Children

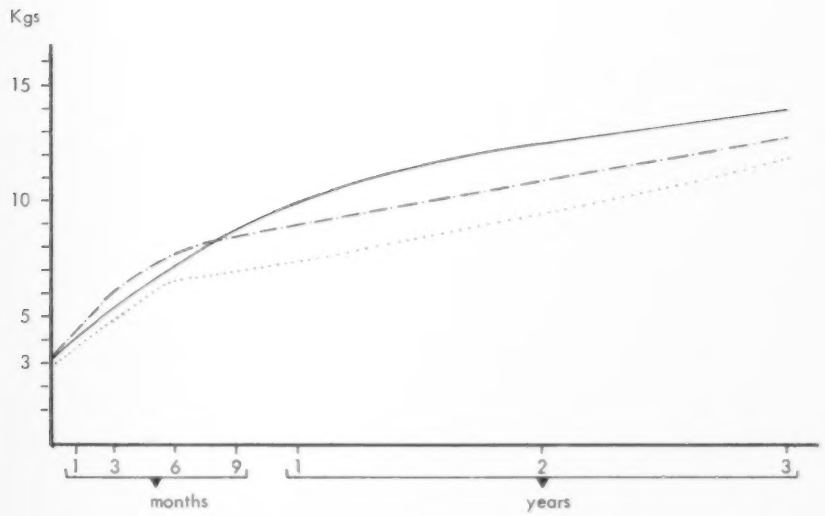


TABLE IV

Percentage of Deceased in Relation to Entrants and according to Age

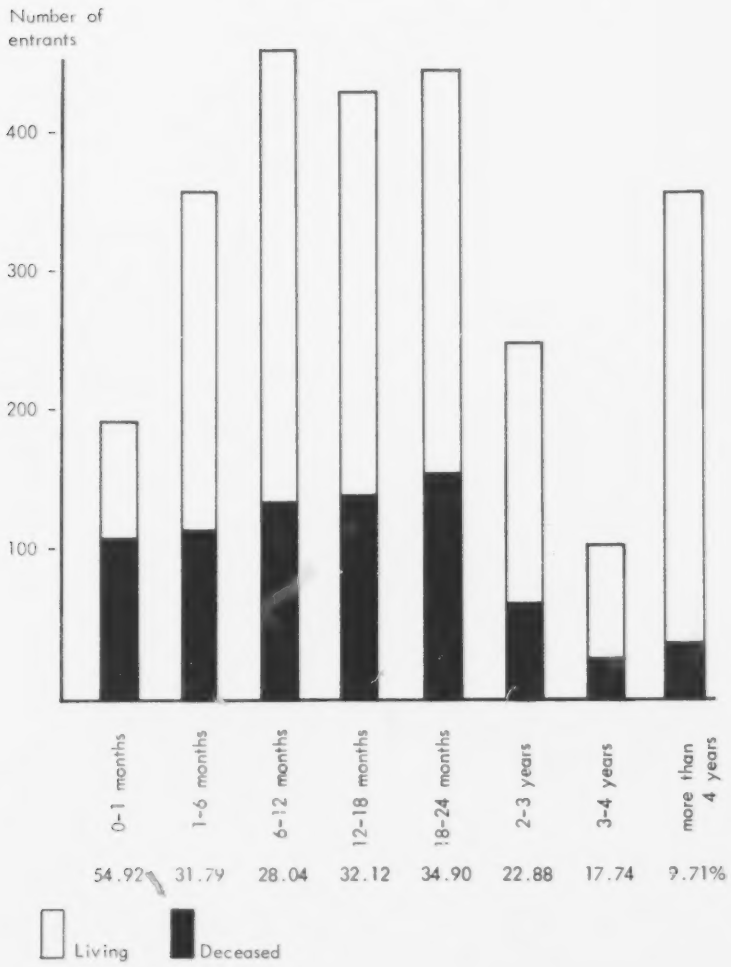


TABLE V

Average Weight according to Age

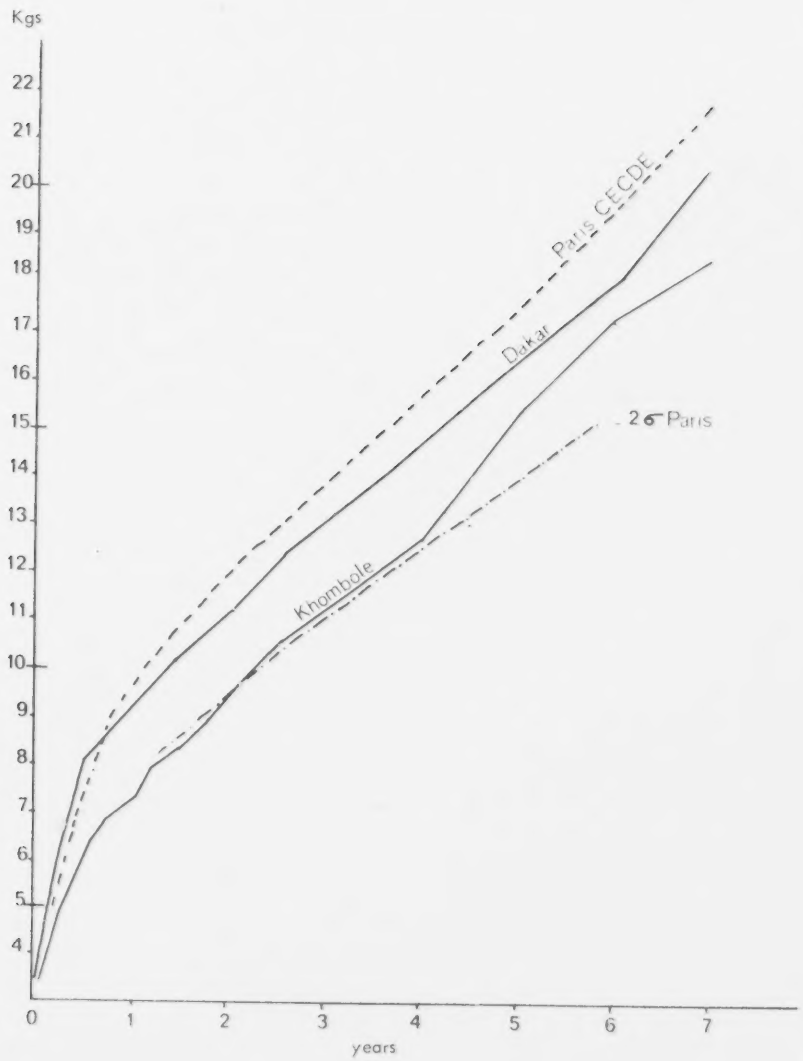
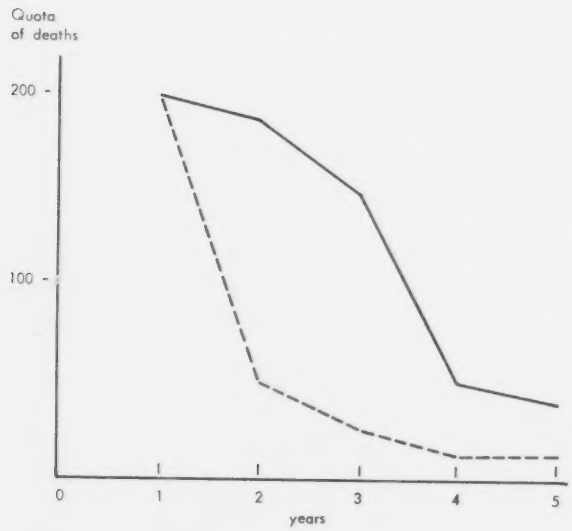


TABLE VI

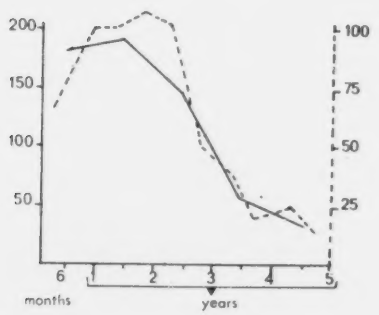
Mortality Rate in Senegal and North France of 18th Century



— Senegal: present day sample (Khombole)
--- North France of 18th century

TABLE VII

Annual and Monthly Mortality Rate in the Rural Zone per Thousand Children



—. yearly
--- half yearly

TABLE VIII

Consumption of Selected Foodstuffs in Two Villages

	Village of M'Gayokhene grams p.d.			Village of N'Gane Fossal grams p.d.		
	Jan/Feb	May/June	Sept/October	Jan/Feb	May/June	Sept/October
Millet and rice	568	537	672	520	488	499
Groundnuts	78	52	4	81	65	-
Niebe	29	3,6	-	15	5	-
Greens	29	37	110	-	-	-
Sugar	2,6	2,7	2,7	2,2	2	1,5
Oil	0,3	0,9	1,4	6,6	2	3,6
Meat	0,6	1,5	12	27	0	9
Skim milk	78	46	62	15	16	35
Fresh and dry fish (1/2 / 1/2)	3	5,5	3,3	15	7	16
Calories p.d.	2230	1933	1911	2191	1856	1654
Difference from need	+ 10%	- 5%	- 7%	+ 3%	- 10%	- 18%
Protein p.d.	72	59	56	73	57	48
Difference from need	+ 18%	- 4%	- 9%	+ 17%	- 7%	- 20%

TABLE IX

Number of Survivors between 0 and 5 Years

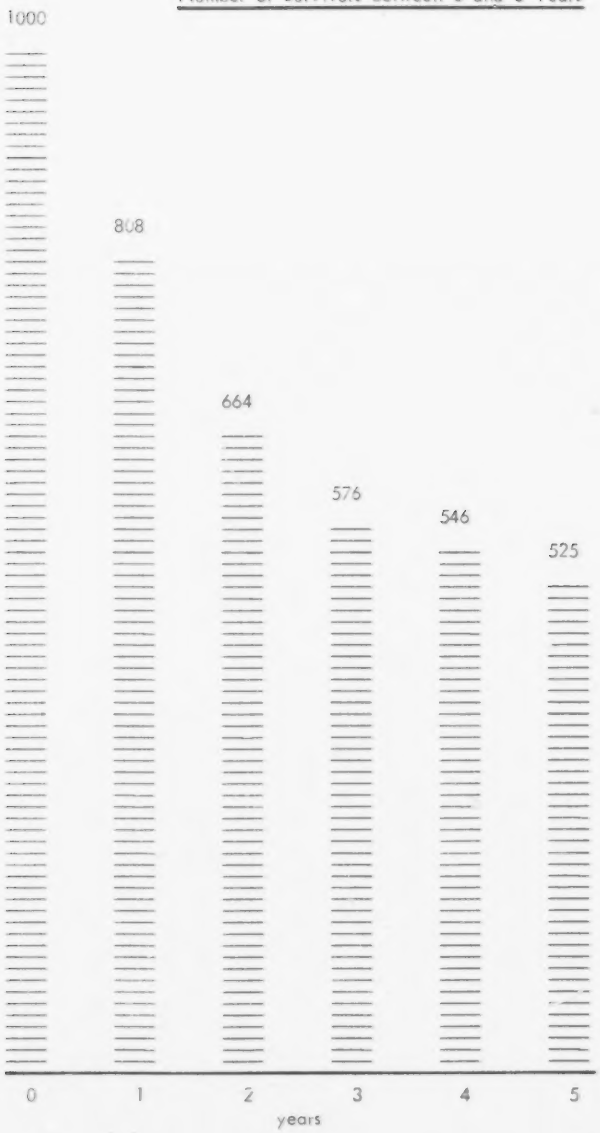
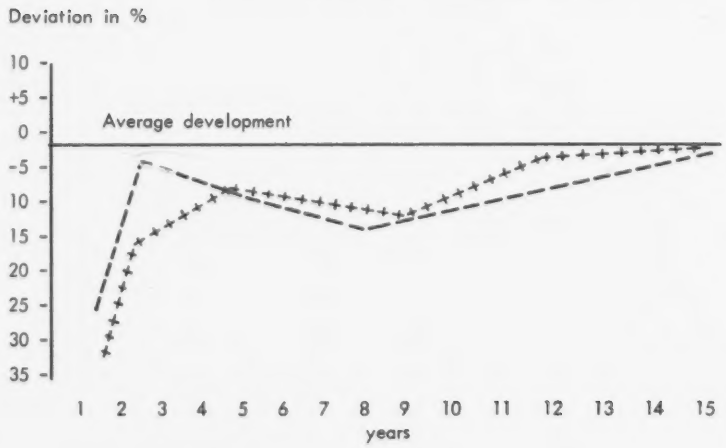


TABLE X

Percentual Deviation from Normal Weight for Age

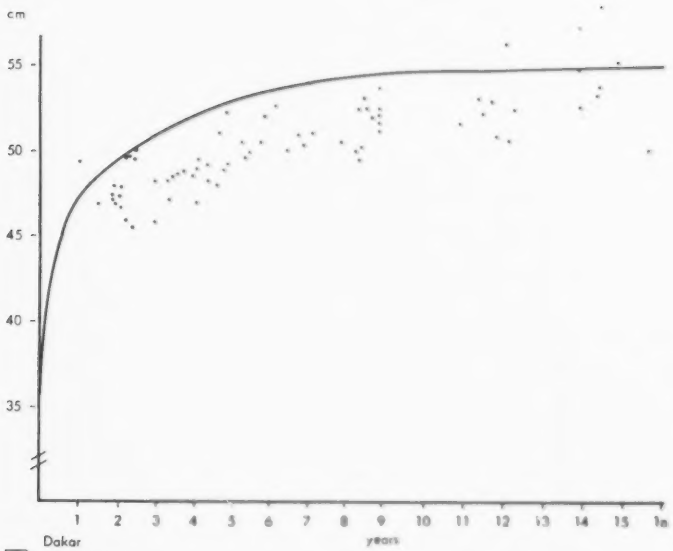


--- Weight increase of girls

+++ Weight increase of boys

TABLE XI

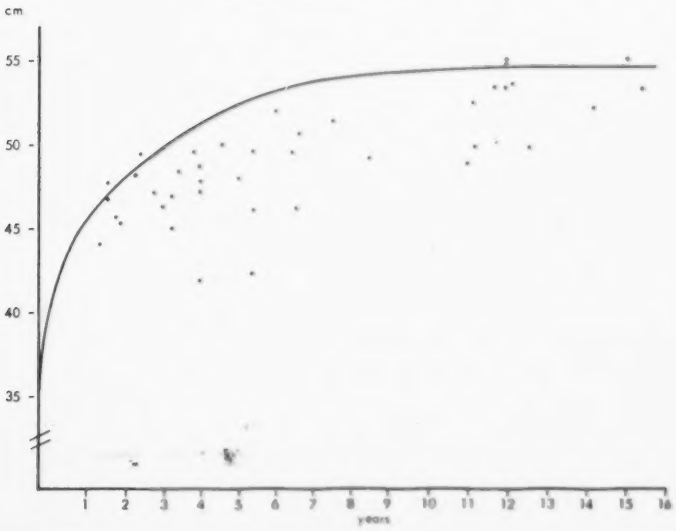
Growth of Cephalic Circumference of Boys



___ Dakar
... Kwashiorkor

TABLE XII

Growth of Cephalic Circumference of Girls



___ Dakar
... Kwashiorkor

TABLE XIII

Failure Rate in Senegal Schools for 1967 - 1968
and Rate of Enrollment according to Levels of Education

	Primary Education						
	Lower level	Preparatory level	Elementary level 1	Elementary level 2	Intermediate level 1	Intermediate level 2	Total
Failures %	14%	15%	15%	15%	20%	40%	20%
Number (boys and girls)	7,573	6,824	6,344	6,112	6,720	16,194	49,757
Pupils							
Number	52,109	45,076	40,065	36,302	32,812	42,385	248,749
of which girls in %	40%	40%	38%	36%	37%	32%	37%
% of the age group enrolled at schools	70%	72%	69%	66%	57%	60%	67%
Average age	8	9	10	11	12	13 years	

9. THE CASE OF WEST MALAYSIA

MIN KEE CHANG

9.1 Introduction

Awareness and concern about educational deprivation and disadvantage in West Malaysia is relatively recent owing to the preoccupation of most developing countries with the more pressing problems of providing schools, teachers and facilities to enable all children to be educated.

Malaysia gained its independence in 1957 after being under the colonial administration of the British Government for almost 150 years. The problems of deprivation and disadvantage in Western Malaysia can best be appreciated against the background of a newly independent country, straining all its resources and efforts to surge ahead economically in order to raise the standard of living for its people, whilst at the same time attempting to forge a nation out of the various ethnic groups that make up its multi-racial population. It will be seen that these tasks for the Government of Malaysia have been made more difficult by the existence of imbalances of ways of life that have developed between the native Malays and the non-native sections of the population and between the rural and urban areas as a result of traditional colonial policy.

As far as the writer is aware, no real research has, in fact, been done on the problems of deprivation and disadvantage in Malaysia. The views expressed in this paper are based either on the documents made available by the Ministries of Education and Health and the Institute of Medical Research in Malaysia or on the writer's inferences of the problems involved based on his knowledge and estimation of local conditions. The views expressed must, however, be accepted as the personal opinions of the writer.

9.2 Background Factors

9.2.1 Economics

Malaysia is comparatively rich in land and other natural resources. It is principally a primary producing country, being the world's largest producer of natural rubber, palm oil and tin. No less than 40% of its products are exported to industrialised countries and a flow of similar size of imports is received to supplement domestic production of goods and services. Over the last three years the volume of total production has increased by 6% annually on average but as is the experience of all primary producing countries, the terms of trade with industrialised countries have deteriorated so sharply that there is an urgent need to broaden the basis of the economy both agriculturally and industrially in order to reduce the dependence of internal growth of investment and activities upon the fluctuating fortunes of its exports of primary products.

9.2.2 Population

Out of a total population of 8.7 millions in 1967, about 62.3% are below the age of 25 years and about 16.3% are in the age group of 0 to 4 years. Malaysia has therefore a predominantly young population, with a birth rate of 3.73% and a mortality rate of 0.76%. It has one of the highest rates of population increase in the world, with a net increase of 2.97% for 1966. This present rate of almost 3% increase per annum or roughly an increase of 250,000 per year is a serious drawback

to development and if unchecked will result in doubling the population within 23 years. If those under 15 and over 65 years are assumed to be economically inactive, the dependency ratio for Malaysia will be in the order of almost 50% as compared to the figure of 22% to 30% in the developed countries of West Europe and U.S.A. In addition, the population in 1967 was made up of three main ethnic groups in the following proportions: native Malays 49.9%, and the non-native Chinese and Indians from South India 37.6% and 11.45% respectively.

9.2.3 Employment

With such a predominantly young population the greatest problems that the country has to face are in providing essential social services, especially education, to the country's youth and in creating adequate employment opportunities for the increasing labour force. At the present rate of overall growth of an average of 6% per annum, and 3% increase in the population, employment opportunities have not kept pace with the increase in the labour force. The active but unemployed rose from 156,000 in 1962 to 197,000 in mid-1967. This problem has been aggravated by the decline in estate acreage tapped as a consequence of fragmentation, lack of control of rents and insecurity of tenure of rural land. It has been estimated that out of a total of 449,510 farms in 1960, 90% of the farms were less than 10 acres and 67% less than 5 acres as against the recommended minimum economic holding for an average family of between 8 and 10 acres.

9.2.4 Rural-urban drift

The stagnation of the rural economy, which has mainly affected the rural Malay population, has caused a drift of Malays, mainly single males, to seek employment in the towns. Between 1931 and 1957, the urban population rose by 200% and the ratio of rural dwellers to those living in the towns fell from 81% to 62%. This rural-urban migration was caused initially by the post-war emergency (1948 - 1960), but has now been aggravated by the lack of opportunities and scarcity of unattached agricultural land in rural areas. The drift of Malay youths into the towns without the skills to obtain employment has brought about social and economic problems of adjustment with the non-Malay sections of the population, who predominate in the towns. This urban expansion has not been followed by growth in industries and commerce and has resulted in slums, overcrowding and squatters. It has been asserted (Baharuddin bin Musa and Shaharuddin bin Haroun, 1970, IV.) that:

> "With 60% of our population under the age of 25 years and more than half of the urban population (which amounted to 31% of the total population in 1957) living in the slums and squatter areas of the major towns of West Malaysia, it means that any study of children and youth in this country must necessarily include an examination into the general housing needs of the country, for it is in these slums and squatter areas that a great number of our youths are growing up to play (or unplay) their rôle in nation building."

9.2.5 Health

The general health of the population could be gauged from the infant and toddler mortality figures for West Malaysia. Though they compare favourably with those of neighbouring countries, they are still high when compared with those of developed countries.

	West Malaysia	Other Countries	Ratio
Infant mortality rate (1963)	56.8	U.S.A. - 25.2	2.2
		Japan - 23.2	2.4
Toddler deaths as % of total deaths	11.0	U.S.A. - 1.0	11
		Japan - 1.5	7.3

The above figures indicate that at least one third (or 33.7% in 1964) die before they reach the age of 5 years. When it is realised that those below the age of 5 constitute about 16% of the total population, this represents a serious loss of natural wealth and reflects the low standard of living and poverty and the lack of related facilities such as medical care and education, particularly amongst the rural Malays.

No detailed infant and toddler mortality rates in urban and rural areas are available, but the following general observations on the standard of health affecting the three ethnic groups could be made:

1) the death rate is greater amongst the Malays than the Chinese;

2) the toddler death rate among the Malays is much higher than that for the Chinese;

3) the knowledge and availability of nutritious food items is sadly lacking amongst the rural Malays who make up 75% of the total Malay population;

4) the prevalence of protein deficiency among the Malay children is high, due to a poor weaning diet consisting mainly of sweetened condensed milk.

9.3 Education

9.3.1 Social attitudes to education

In order to understand the national education policy of independent Malaysia, it is necessary to go back to the pre-war and post-war periods prior to independence in 1957 and to examine the changes in the aspirations and attitudes of the various races that make up the multi-racial population of the country. It will be observed that these aspirations and attitudes were in constant flux, creating tensions and sometimes conflict in their wake, emerging at times as group or communal sentiments and at other times as nationalistic sentiments, giving rise all the time to new aspirations, all of which are reflected in the changing pattern of the educational system as the country approached independence.

Prior to the Second World War (1941 - 1945), when Malaysia was under the British administration, it could be said that the various races retained their traditional ways of life. There was very little inter-marriage; so far as they co-operated, they did so with a minimum of social intercourse. There was little else that bound them together by way of tradition, customs, religion, ambition or outlook shared by them. This situation fitted in well with the basic colonial policy of allowing the various races to live in their traditional ways in order to justify the presence of the metropolitan power in the country.

As a consequence of this policy, the Malays, who lived mainly in the rural areas, were provided education in Malay schools in kampong or village areas, which reached only up to Standard 6 or Standard 7 in some states. The syllabuses in these kampong schools kept them on the land because it was the intention of the British that the Malays should remain in the rural areas. In the training courses

for Malay school teachers the emphasis was mainly on gardening and arts and crafts, besides the basic three R's.

In the case of the Chinese, very little financial assistance was given to education by the British Government because the Chinese, who live mainly in the towns, could go either to the English-medium schools,provided by the Government and the missionaries, or to Chinese schools supported mainly by Chinese businessmen and philanthropists. These Chinese schools relied almost entirely on recruitment of teachers from abroad, mainly from China, and provided education up to secondary or high-school level. These foreign teachers brought with them not only their own ideas of education but also the politics of China into these schools. As a matter of fact, the syllabuses and text-books used in these schools were largely based on those used in schools in China. Under such circumstances, it was only natural that pupils in these schools should have their sights turned towards what they regarded as their motherland. The immigration policy of the British administration was of course very liberal. The Chinese generally, with the exception of those who were born and bred in this country or who were educated in the English medium schools, tended to cherish the hope of retiring in China after they had made the best use of their stay here. These Chinese schools were in fact preparing pupils for admission to institutions of higher learning in China.

As for the Indians, who originally came to this country as labourers to work in the rubber estates and open up the roads and railways and lived mainly in the estates or on the fringes of towns, their children could go to English schools in the towns if they could afford the expense, or to the estate schools, which the owners of these estates had to provide under the compulsion of the International Labour Ordinance. These estate schools did not go beyond the primary stage as in the case of the Malay schools.

The missionaries and the British Government built almost all their English schools in the towns and urban areas. Education in these schools was provided up to university level. Because the majority of the Malays lived in the rural areas, there were few Malays in English schools. The minority of Malays who went to English schools, including those pupils from Malay primary schools who were transferred to English primary schools through the scheme of Special Malay classes, were able to proceed to secondary education in English and from there to university and finally to obtain better jobs. The effect was that Malay parents began to lose faith in the schools in the rural areas. The concentration of English schools in the towns therefore benefitted mainly the Chinese and the Indians and only a small minority of the Malays. This factor must be remembered in order to understand the impatience of Malay parents and their insistence on greater facilities for their children in the post-war period, especially after independence.

In the immediate post-war period, owing to a stricter policy restricting immigration into the country and to political development in China and India, the immigrant races, namely the Chinese and the Indians, began gradually to look upon Malaya as their home of domicile. The effect of an increasingly more settled population amongst these immigrant races was that greater interest was shown in the form of education provided. This was also true of the Malays, whose pre-war indifference to education had largely disappeared as the economic value of education became more evident - it was the passport to more remunerative employment. They keenly realised that education was a necessity for them to hold their own, politically and economically, especially with the Chinese. Thus, a greater awareness of community

feeling in each of the three ethnic groups emerged in the post-war period, and a growing demand for more education and for change in the educational pattern to meet post-war conditions.

9.3.2 National education system from 1957

It is against this historical background of the changing social pattern that the national educational policy for Malaysia as recommended in the Report of the Education Committee in 1956 was approved in principle by the Federal Legislative Council in 1957 and embodied in the Education Ordinance of 1957. The objectives of the national system of education were given in the First Malaysian Plan:

1) to satisfy the needs of the nation and to promote its cultural, social, economic and political development and unity;

2) to provide educational facilities, particularly at the secondary level, to meet the needs of the increasing school age population;

3) to improve the quality of education and to spread educational opportunities more evenly throughout the country so as to correct imbalance between the urban and rural areas;

4) to diversify educational and training facilities in vital fields, especially those relating to agricultural and educational science and technology;

5) to accelerate teacher training in order to produce the necessary number of qualified and skilled teachers.

The structure of the educational school programme is 6 years of primary education, followed by 3 years of lower secondary and 2 years of upper secondary and 2 years of pre-university or sixth form education, making a total of 13 years before admission to university or higher education. In 1961, primary education was made free to all pupils, 19 years ahead of the target set by UNESCO for Asia. In 1965, the entrance examination for primary to lower secondary education was abolished and all primary school pupils were given the right of three further years of education of a comprehensive type. At the end of 9 years of continuous education, these pupils will be required to sit a Lower Certificate Examination, on the basis of which, with the help of counsellors and guidance officers, they will, it is hoped, be able to decide on the type of upper secondary and post-secondary education that will meet with their special aptitudes, skills and interests.

The guiding principle in framing the national education policy was the expressed intention of the government of making Malay the national language of the country whilst preserving and sustaining the growth of the language and culture of other communities in the country. Malay as the national language is a compulsory language throughout the school system, both as a subject for study in the non-Malay media primary and secondary schools and also as the main medium of instruction at both primary and secondary school levels. The ultimate objective of educational policy in the country is to bring together children of all races under a national educational system in which the national language is the main medium of instruction. Towards this objective, secondary education in the medium of Malay was provided for the first time in 1958 and has been extended to university level. A national university with Malay as the sole medium of instruction was in fact opened in 1969.

The other languages, namely Chinese and Tamil, are used as the medium of instruction at the primary level and can be offered as subjects of study at both primary

and secondary school levels. With the establishment of the Department of Chinese and Tamil Studies at the University of Malaya, pupils in the nation' schools and at the University of Malaya can now offer Chinese and Tamil as subjects of study from primary to secondary up to university level.

Primary education from 1957 to 1969 under the national education system was provided in the language of the family - i.e. in the four languages of Malay, Chinese, Tamil and English. Thus, there were four language types of primary schools and parents had the right of choice of the type of primary education they wished for their children. At the secondary and tertiary levels, education is provided in the medium of Malay and English. As from 1969 a new policy has been introduced whereby Malay will gradually replace English as a medium of instruction and English will be taught as a second language. More allocation of time will be given to English in order that pupils will be able to gain a good command of this language to profit from the rich literature available in that language. It is felt that a national educational policy with Malay as the main medium of instruction and with English as an important second language will not only help in the process of nation building in the multiracial society of Malaysia but will also help to maintain Malaysia's position in the world.

9.4 Present Situation

9.4.1 Forms of malnutrition

Recent nutritional studies conducted in West Malaysia have shown that the main problems of nutrition are those resulting notably from a lack of animal proteins, vitamins and certain minerals in the diet. These problems of nutrition prevail commonly amongst rural dwellers with the growing child and women of child-bearing age particularly vulnerable. The following forms of malnutrition have been discovered:

1) Protein deficiency. The mortality rate for toddlers (deaths of children between 1 and 4 years of age) for instance is now widely accepted as an important pointer to protein malnutrition. Dr. Florence Thompson's findings are that the average protein intake is 49 grams - low when compared with the recommended level of 69 grams (Aziz, 1965, 1.). According to Dr. Chong (1968, 1.) the toddler mortality rate is ten times as high as that found in developed countries.

2) Vitamin deficiency. Vitamin A deficiency is an important nutritional problem. Keratomalacia has been cited as the cause of blindness, particularly amongst children between 3 and 5 years. This is mainly due to the diets poor in Vitamin A, lacking in both eggs and green vegetables. A recent nutrition survey of pre-school children in several rural villages has revealed that clinical Vitamin A diseases are also common.

   The removal of Vitamin B (thiamine) from the staple food, rice, is the cause of beri-beri. Indian and Malay labourers who tend to eat more parboiled or home-produced rice respectively do not suffer generally so much from beri-beri as the Chinese, who relish white milled rice. Although beri-beri is now a rarity in Malaysia, the sub-clinical form of the disease, due to a diet with marginal amounts of thiamine, can still be found amongst pregnant women and those who have to do active physical work.

3) Mineral deficiencies. Nutrition surveys have shown that iron deficiency is common amongst the Indian labour force in rubber estates, in children and in pregnant women. In the case of iodine deficiency, surveys in certain rural areas have shown

that up to 40% of the people suffer from enlargement of the thyroid gland with a higher percentage of women suffering from this than men.

4) General food deficiency. In an FAO survey (Sedky, 1962, 1.) it was found that the daily intake of nutritional constituents was inadequate in amount and quality to provide the required allowances of proteins, minerals and vitamins:

Daily per capita intake of nutritional constituents and percentage of the daily allowance

Item	Daily recommended allowance	Daily amount consumed	Intake %
Calories	2,260.00	2,262.82	100
Protein gm	61.00	46.94	77
Calcium mg	0.55	0.45	83
Iron mg	11.60	10.71	92
Vitamin A mg	4,581.00	2,761.60	60
Thiamine mg	1.15	0.78	68
Riboflavin mg	1.54	0.52	34
Niacin mg	15.84	9.33	59
Ascorbic acid mg	72.80	51.68	71

With rice the staple food of the three ethnic groups, supplying over 50% of the total calories, the losses of certain nutrients, such as thiamine, riboflavin, niacin and calcium during milling causes a marked reduction in the intake of such nutrients.

9.4.2 Endemic diseases

The problems of malnutrition are aggravated by the presence of malarial parasites, heavy hook-worm and whip-worm infection. It is estimated that 80% of the rural population or about 4 million people are infected with heavy hook-worm and about 35% are infected with whip-worm.

9.4.3 Distribution of deprivation and disadvantage

Deprivation and disadvantage are generally found in the following low-income groups in the traditional rural and urban sectors of the country:

Traditional rural sector:

1) aboriginal tribes living nomadic lives in the jungles, who are being cared for by the Department of Aborigine Affairs. Special schools have been set up for children of school-going age with a view to integrating them with the native Malays in the villages;

2) rural Malays engaged in agricultural pursuits, such as rice growing, in small uneconomic holdings. Such work is seasonal and dependent on natural irrigation;

3) rural Malay smallholders ekeing a living, tapping rubber in smallholdings. Earnings are subject to the frequent fluctuations in the export prices of rubber;

4) the Chinese and Indian estate workers in small rubber estates barely earning a subsistence wage.

Traditional urban sector:

1) petty traders and shopkeepers from amongst the Malay, Chinese and Indian communities, largely self-employed, living mainly in the slum and squatter areas in the urban areas;

2) Malay migrants from the rural areas, attempting to take part in the commercial activities and job opportunities in factories and firms in urban areas. The majority of these migrants are single males without the necessary skills for such employment;

3) large groups of unemployed youth from the three ethnic groups are being turned out of the school system every year without job opportunities. It has been estimated that three quarters of the unemployed labour force in 1967 were below the age of 21 and about 70% of them were first time job seekers;

4) the low-paid workers from the three ethnic groups employed in firms, factories and industries, most of whom are living in the slum and squatter areas in the towns and cities.

It is not possible to give details of the distribution of deprivation and disadvantage amongst the population, by ethnic groups and by location.

9.4.4 Duration of deprivation and disadvantage

There is no minimum wage legislation in the country. Generally speaking, the fortunes of the low-income groups depend a great deal on the fortunes of their employment and the extent of help they can receive from relatives in the extended family system. It could be said in general terms that deprivation and disadvantage of the low-income groups are constant occurrences, which will be somewhat alleviated when high prices prevail for the primary products of rubber, palm oil and tin, and aggravated in times of falling prices. To give an example of the effect of the fall in the price of the most important of the primary products, rubber, on the economy, a fall in price of 1 Malaysian cent on the export price of this commodity will result in the loss of about Malaysian $ 12,000,000 in the revenue of the country.

9.4.5 Social disparities

There are no class or caste distinctions or groups, which keep apart the deprived and disadvantaged groups from those which are not so. Since independence there has been better understanding between the three ethnic groups. It is hoped that with the use of a common national language and the development of a conscious identity with the country through the national educational policy a nation could be built.

The low-income groups are clearly in a disadvantaged position and tend to confer disadvantages on their children. Poverty per se is not necessarily a hindrance to success in school. There are some children of poor people especially in the urban areas, where school facilities are generally above the average, who do extremely well in school, partly because of high innate ability but also partly because their parents give them help and stimulation. They are, however, a minority. There is no doubt that a number of disadvantages are correlated to a high degree with economic poverty poverty even in urban areas. Therefore, the children from families that are visibly poor are very likely to show visible disadvantages in their school work. This is particularly true in the case of children in the rural areas, where the village (or kampong) schools are generally poorly constructed and equipped and staffed with teachers who are not as well qualified academically and professionally as those serving in better schools in the urban areas. Generally speaking, it could be said that the farther away from the big towns the poorer the health and educational facilities.

9.4.6 Remedial actions undertaken

Largely as a result of the efforts and stimulus of the Food and Agricultural Organisation (FAO), World Health Organisation (WHO) and the United Nations Children's Fund (UNICEF), Malaysia, in line with other developing nations, has now begun to realise that the problems of nutrition cannot be solved by isolated and uncoordinated activities. There is definite awareness of the problems of deprivation and disadvantage caused by malnutrition and endemic diseases. Concern in terms of action is being reflected in greater co-operation and collaboration in coordinated long-term action programmes between relevant Government Ministries, dealing with public health, nutrition, dietetics, agriculture, education and community development, and between these public departments and voluntary agencies in the private sector.

The following measures to reduce the nutritional problems have been introduced in West Malaysia:

1) Rural Health Services Scheme: This was originally planned in 1954 and implemented through a series of 5-year plans to provide maternal and child health care. There are now 45 main centres, 118 sub-health centres and 1,003 midwife clinics, providing preventive and curative services to over 3 million rural inhabitants. Nutrition education is supplemented with audio-visual aids and cooking demonstrations.

2) UNICEF Skim Milk Scheme: This is provided free to pregnant mothers and babies. In 1968, 48,000 lbs were provided for over 15,000 mothers and babies. No evaluation has been made of the success of this scheme.

3) Applied Nutrition Project: This project has been planned as a community development project to improve the nutritional status of the people with support from WHO, FAO and UNICEF. It was initially launched as a pilot project in August 1969. Baseline surveys have shown protein defficiency, Vitamin A and iron deficiency among toddlers. A joint work-shop to coordinate efforts was planned in June 1970 with a view to evaluating the pilot project in 1971 before extending it to other areas from 1972 onwards.

Realising that as long as the imbalance of life exists between the rural and urban areas and between the native Malay and non-Malay sections of the population, there can be no basis for a united nation, the Government of Malaysia had, in addition to special programmes in health, education and agriculture for native Malays, launched the following projects to assist the native Malays in commercial business enterprises:

1) Majlis Amanah Ra'ayat Bumiputra (MARA): to provide training and education required in commerce and industry, to offer scholarship for further studies overseas. In addition, it provides loans for construction, commerce and industry, and transport and investments in subsidiary organisations. With the assistance of a Sino-Malay Economic Co-operation Advisory Board, plans have been prepared to provide Malay businessmen with the necessary expertise to encourage joint Sino-Ma'ay ventures at all levels and to seek employment for Malays in factories, business and commerce.

2) Bank Bumiputra was set up in 1966 to give short term capital to Malay entrepreneurs and to act as a saving institution for bumiputras.

3) The Agricultural Development Bank was set up in 1969 to promote sound agricultural development, coordinate and supervise the granting of credit for agricultural purposes, provide credit for developing all aspects of agriculture including production and marketing and finally to mobilize the savings of the agricultural sector.

4) The $ 50 million National Corporation (or Perbadanan National Berhard - Pernab) was set up to widen the scope for Malay participation in business and industry side by side with current Malay efforts as in mining ventures in Malay reservation areas.

The following schemes have been operated for the growing numbers of unemployed youths by the Ministry of Youth, Culture and Sports, to provide some form of vocational training in order to fit them into society:

1) A National Youth Pioneer Corps was set up in 1966 for youths between the ages of 16 and 25 years to undergo 18 months of vocational training plus para-military training to develop discipline. 70% of the youths are trained for the agricultural section and 30% for the industrial section.

2) A National Youth Development Corps was set up in 1969 for unemployed youths between the ages of 16 to 25 to provide a basic course of three months in discipline and re-orientation, before pre-vocational training is given in institutions or in employment as in industrial training institutions and the National Youth Pioneer Corps. It is planned to train over 12,000 youths a year under the scheme.

The following institutions are engaged in the study of the problems of deprivation and disadvantage in Western Malaysia:

1) The Institute of Medical Research, Kuala Lumpur
2) The Department of National Unity, Prime Minister's Department, Kuala Lumpur
3) University of Malaya, Kuala Lumpur - Faculties of Social Sciences, Economics, and Department of Paediatrics, Faculty of Medicine
4) Government Ministries of Health; Social Welfare; Education; Youth, Culture and Sport; Rural Development.

9.5 Effects of Malnutrition and Diseases on Education

As far as the writer is aware, there has been no serious study of the effects of malnutrition and endemic diseases on education. This is probably due to the fact that the literature on disadvantage and deprivation in education has not yet penetrated the country to any great extent. In view of the growing concern expressed by the Ministries of Health and Education on the effects of malnutrition and endemic diseases on the health of the child, it is hoped that the special problems of absenteeism, apathy, loss of vigor, etc., will be studied in depth in the near future.

9.6 The Rôle of Education in the Fight against Malnutrition and Diseases

9.6.1 School and community

Whilst the Ministry of Health in conjunction with its related departments, such as the Institute of Medical Research, is looking into the medical aspects of the problems of malnutrition and endemic diseases, the Ministry of Education is working closely with voluntary agencies in the matter of school meals and with the Ministry of Health in a joint School Health Programme:

1) School Feeding Scheme: This was launched as a pilot project in 1962 to provide nutritional supplement to poor school-going children. This programme is benefitting more than 100,000 children today. This scheme is mainly carried out by a number of voluntary agencies with nominal support from Government. The ingredients are supplied gratis under the U.S. PL 480 programme. There is now a move for

coordination and integration of school feeding schemes with supplementary feeding and nutrition education programmes.

2) Joint School Health Programme: In the past except for school dental services, school health services were virtually non-existent. Based on a clinical survey of 6,000 primary school children in 22 rural schools in Province Wellesley, it was found that incidence of worm infestation was high (Malays 89%, Indian 83% and Chinese 64%). It was also estimated that 80% to 90% of the 1.8 million school children suffer from dental maladies. In 1967 a Joint School Health Programme was decided upon between the Ministries of Health and Education with a blue-print of action in the following areas:

   - school health services to provide for periodical appraisal, examination and detection of abnormalities and for control of communicable diseases;
   - school health education to provide formal and informal learning experiences as part of the school curriculum;
   - healthy school environment to improve the physical and emotional environment in schools;
   - school community co-operation for health, to use the school as the agent for change and to integrate the school health programme with the total community programme.

A National Seminar was held on the Joint School Health Programme in 1968 to discuss the implementation of the School Health Programme and to consider priorities for implementation. The following projects have been carried out or are being planned for execution:

1) Under school health education, new syllabuses on health education have been drafted for primary and secondary schools and teacher training colleges with the help of WHO consultants. In addition school broadcasts on health education are being planned to reach children and parents in both urban and rural areas.

2) Under school health services, surveys have been made to obtain baseline data on existing health facilities such as dental and mobile clinics available. It is hoped to examine all primary school entrants and to cover all school children up to secondary schools.

3) Under healthy school environment, plans are being made to use health inspectors to carry out inspection of both the physical and emotional aspects of schools.

4) Under school community co-operation for health, a malaria eradication campaign is being carried out jointly by the community and the school children. After baseline surveys have been completed, it is planned to involve the schools in a pilot project in the rural areas of eleven states to control worm infestations.

9.6.2 Educational deprivation and disadvantage

As a result of the introduction of free primary education in 1961, followed by the abolition of the 11+ examination and the offer of three further years of secondary education of a comprehensive type to all primary school children, the right to nine years of continuous education is enjoyed by all children in Western Malaysia. There is no categorically defined educational deprivation under the national system of education, i.e. no child is denied access to educational facilities owing to his colour, religion, sex or family income.

There is however some degree of effective deprivation in the sense that low-income families living in the isolated rural area and in the slum and squatter areas in the towns, are compelled to send their children to schools which are below average in achievement and in the quality of the teachers. This is especially true in the case of the Malays, living in the small villages in the rural areas, where schools are as a rule temporary structures with poor equipment and ill-prepared teachers. The isolation of these village schools from one another and from the major towns, where secondary schools are normally sited, impoverishes the rural environment and exerts a form of effective deprivation on children living in these areas. Research findings in similar deprived areas in the U.S.A. have indicated that children tend to suffer from disadvantage through the neighbourhood play groups and gangs, which discourage effective school work, and also through the absence of adults, who are noted for their competence in work or in studies, and finally from infant mortality. Youth in these areas, aggravated by the poverty of their parents, finds it difficult and unattractive to continue in education or to proceed to secondary education.

A study of the enrolment and wastage ratios in the schools confirm the high correlation between deprivation and disadvantage that exists in almost all developing or low-income countries. It has been estimated by Baharuddin bin Musa and Shaharuddin bin Haroun (1970, IV.) that the school enrolment ratio in schools in West Malaysia between the years 1966 and 1969 fell from 90% of total population in primary schools (ages 6 to 11) to about 50% in lower secondary schools (12 to 15), 17% in upper secondary schools (15 to 16) and about 2% in post-secondary or sixth form schools (age 17 to 18).

Against these enrolment ratios, it has been estimated by the same authority that for the same period only about 69 out of every 100 pupils processed from primary to lower secondary education despite the abolition of the 11+ examination in 1964. The wastage rate of 31% is clearly due to economical and social reasons. From lower secondary to upper secondary education, which is effected by a terminal examination, the Lower Certificate examination, the survival rate of 60% in 1966 fell to 49% in 1969. Only 13 out of every 100 pupils in Form 5 proceeded to Sixth Form or post-secondary education. These wastage rates in schools in West Malaysia are lower than the average rates for schools in most neighbouring countries of Asia (UNESCO, 1966, III.), but are high when compared to the rates obtaining in developed countries.

Top priority has been given in educational planning in West Malaysia to special measures aimed at redressing the imbalances between the English medium schools on the one hand, and the other media schools on the other, and also between schools in urban and those in the rural areas.

9.6.3 Teacher-training policy

In place of a laissez-faire policy of separate training schemes for different media schools and for different levels of teaching under the British administration, the Ministry of Education under the national education system coordinated all training programmes for different language media schools at both primary and lower secondary school levels by providing a common training course and insisting on the same minimum entry qualifications. In the case of teachers for primary schools, the minimum entry qualification from 1957 to 1963 was successful completion of three years of secondary education. This qualification was much higher than that hitherto required for teachers in Malay, Chinese and Tamil media schools. In 1964, this entry qualification was raised to a full secondary education of five years, which was the

minimum entry qualification for teachers trained for lower secondary classes. It could therefore be claimed that despite the phenomenal expansion of both primary and secondary education West Malaysia was able to raise the minimum entry qualification for teachers and to achieve parity in both training and qualifications for teachers for all the language media schools. This achievement does not, however, obscure the fact that about 20% of the present 65,000 teachers are underqualified in terms of present standards and these underqualified teachers are serving mainly in the Malay, Chinese or Tamil media schools.

9.6.4 Reorganisation of rural schools

Because of their isolation, social attitudes and poverty, it has not been easy to reorganise village (kampong) schools in the rural areas to make them educationally more efficient. There has always been a certain pride of simple village people in their own village school. Past policy has been to respect the wishes of the villages by providing them with small schools, which invariably tend to be temporary structures with very little equipment and ill-prepared teachers.

A survey conducted in 1958 by the writer in one of the less developed states in the country showed that about 75% of these village schools had multi-grade classes and as many as 35% of these schools were one-teacher schools with multi-grade classes. The difficult conditions under which underqualified teachers have had to work in village schools in the rural areas are further aggravated by the impoverished environment and the poverty of the rural people. All these factors combined with the authoritarian rôle structure, generally found in low-income families, to prevent the young child's mind and vocabulary from developing to the point where the child could profit widely from school.

In the light of these findings, an attempt was made in 1958 - 1959 to reorganise the structure of these small village schools by combining wherever practicable small schools into more economic schools with a view to fostering more contact between village communities. It was hoped that by so doing, the environment would become richer and more stimulating for children in the villages concerned. This plan was implemented in various ways, depending on the state of development of the villages concerned.

This reorganisation plan for village schools is based on the general proposition that intelligence is best developed on the basis of experience and environment and is not determined simply by biological inheritance. The index of educational progress in rural areas in developing countries in the view of the writer is the gradual reduction or elimination of small uneconomic schools by bigger and more efficient schools.

The findings of psychologists (Bloom, 1964, IV; Hunt, IV) have emphasized the importance of experience and environment, both family as well as physical, in the intellectual development of the young child, especially during the pre-school years. These studies have put great force behind the movement of "compensatory education" to help compensate the child for an inadequate family environment. In the light of these research findings, educational planners are faced with a dilemma in determining priorities in education programmes for both developed as well as developing countries. Whilst developed countries with their relatively greater resources are showing more concern over pre-school education and qualitative measures in education, developing countries are straining their limited resources to meet the demands of formal education starting at the primary level, and to improve the quality of

education provided at these levels. If the conclusion of Professor Bloom that the individual develops about 50% of his mature intelligence between conception and age 4, and another 30% from ages 4 to 8 and the remaining 20% from ages 8 to 17 is valid, developing countries, particularly Malaysia with 16.3 of its total population in the age group of 0 to 4 years and about 62.3% below the age of 25 years, cannot afford to continue to overlook the importance of pre-school education at the nursery and kindergarten levels in their educational priorities.

9.6.5 Special education for handicapped children

With the help of a consultant in special education from the American Foundation for Overseas Blind and an expert in the education of deaf children, the study of the educational needs of disabled children was conducted in Malaysia. In the light of these studies, the Ministry of Education of Malaysia recognised the importance of the emotional adjustment of the different classifications of disabled children and youth with respect to their vocational placement and adjustment and decided to integrate the education of these disabled children, who are physically, emotionally, socially and educationally handicapped, into the existing regular school programme. Accordingly, a number of special classes have been set up in a number of regular schools throughout the country for disabled children who are blind or deaf. Teachers for these special disability areas have been trained in a one-year's course at the Specialist Teachers' Training Institute in Malaysia or in U.S.A., United Kingdom, Australia and New Zealand under Federal Government or Colombo Plan Scholarships.

9.7 Further Action

As far as the writer is aware no priorities have been set for the treatment of causes of deprivation in Malaysia. The Ministries of Health, Education, Social Welfare and Youth and Culture, have plans of their own in dealing with the causes of deprivation in Malaysia. In addition, the Ministry of Rural Development is looking into the special problems affecting the economic well-being of the rural communities. It is hoped that the recent national seminar on planning for the children and youth of this country will come out with schemes for deprived children and youth in this country and with proposals to coordinate the programmes of all the institutions connected with the problem of malnutrition and endemic diseases.

The following researches have been carried out but the reports have not been available for incorporation in this paper:

1) Paper by Ungku Omar, late Director of the Institute of Medical Research, on the effects of malnutrition and endemic diseases on the health of the people in Malaysia.

2) Paper on poverty in Malaysia by a member of the Faculty of Economics, University of Malaya.

3) Report of the National Seminar on the Planning of Youth and Children in West Malaysia held in July 1970.

In this writer's view research should be carried out on the following problems or handicaps resulting from the effects of malnutrition and endemic diseases on the health and education of children in Malaysia.

1) Effects of malnutrition and endemic diseases on the health of children in schools;

2) the eating and living habits of the three ethnic groups, especially those in the low-

income groups, with detailed study of the family structure, conditions of home and parental attitudes;

3) the importance of pre-school and primary education in the intellectual development of the child;

4) a study of the environment and its influence on children of low-income groups living in isolated rural areas, and in slums and squatter areas in the towns.

The following Malaysian institutions conduct research on problems connected with the health and education of children in schools and could be invited to collaborate in research on the effects of malnutrition and endemic diseases on children in Malaysia:

1) Institute of Medical Research

2) University of Malaya - Faculties of Paediatrics, Education, Social Sciences

3) Ministry of Health - Division of Public Health

4) Ministry of Education - Educational Planning and Research Division and Schools Division

5) Ministry of Social Welfare

6) Ministry of Culture, Youth and Sports

7) Prime minister's Department - Economic Planning Unit, Malaysian Centre for Development Studies, and Development Administrative Unit

8) Ministry of Agriculture - Division of Agriculture and Economics and Statistics Section, and Drainage and Irrigation Division

9) Ministry of Lands and Mines - Department of Aborigines

10) Federal Land Development Authority

11) National Family Planning Board

12) Federal Agricultural Marketing Authority

13) Federal Industrial Development Authority

14) Ministry of Rural Development

15) Ministry of Transport - Planning Division.

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CANOSA, C.A.: Nutrition, physical growth and mental development.[+]

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EPSTEIN, E.H. (University of Wisconsin, USA): Extra-societal effects on academic performance.

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HOOKHAM, E. (Department of School and Higher Education, UNESCO, Paris): Notes for discussion.

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USBORNE, V.: Some notes on urinary bilharziasis in Sukuma schoolchildren especially as regards scholastic performance.

[+] Reproduced in this volume.